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HOPKINS (J. C. F.). **Notes on Alternaria (brown) leaf spot of Tobacco.**—*Rhod. agric. J.*, xliii, 2, pp. 114–116, 1 pl., 1946.

The designation '*Alternaria*' [*R.A.M.*, xxiii, p. 483] has become a synonym in Rhodesia for bad tobacco, and although much of this poor-quality tobacco comes from soil on which leaf spot frequently develops, it usually shows no trace of the disease. Tobacco attacked by *A. longipes* shows a leaf spot differing from wildfire [*Pseudomonas tabacum*] in having a bright canary-yellow halo, preceded by a small brown spot, whereas wildfire spots start with a greenish-yellow halo, in the centre of which a light brown spot develops subsequently. Early diagnosis of the *Alternaria* disease is of the first importance. Harvesting of all leaves directly the earliest stages of spotting are noticed is imperative; field dusting and spraying should follow immediately. Two applications of dust or spray with an early reaping, where primary infection has just begun, have proved effective. Failure to strip leaves as soon as the disease is noticed will almost certainly result in the infection becoming epiphytotic in the course of a few days, especially in wet weather, and the crop being lost.

Experiments now proceeding may throw light on the effect of time of planting and type of fertilizer on the incidence of *Alternaria* leaf spot. Meanwhile it is fairly certain that tobacco grown on second- or third-year land is more susceptible than that grown on virgin soil or newly opened fallow and that early plantings, particularly on old soils, are likely to become severely infected. New land, therefore, should be planted early and old land late. The crop is most susceptible to damage when topping time coincides with a long spell of wet weather. It appears that susceptibility or resistance in plants is conditioned by the nitrogen balance within them. Leaves attacked by *A. longipes* are usually large and coarse with a low carbohydrate content, without much 'body' or gummy substances. This is attributed to an excess of nitrogen and mineral deficiency, but reductions in the total application of complete fertilizer in order to reduce the amount of nitrogen is not recommended as it leads to the production of bodiless leaf which scorches during curing. It is this sort of tobacco which has been dubbed '*Alternaria*' in some districts.

NATTRASS (R. M.) & CICCARONE (A.). **Bacterial canker of Tomatoes in Kenya.**—*E. Afr. agric. J.*, xii, 1, pp. 26–29, 1 pl., 1946.

The first occurrence in Kenya of bacterial canker disease of tomato (*Corynebacterium michiganense*) [*R.A.M.*, xxv, p. 425] was observed near Nairobi in June, 1945, causing almost total loss on a small plot at the Scott Laboratories. Identification of the organism was confirmed by W. J. Dowson. As far as is known this is the first record of this disease in East Africa, nor is it believed to have been recorded from South Africa or Rhodesia. In Kenya its status is not yet known, but the severity of the initial outbreak suggests an ability to cause considerable loss.

After recording the symptoms of the disease the authors express the opinion that most of the primary infections are derived from diseased seed. This was probably the case in the initial outbreak at Nairobi but, as over 80 per cent. of the plants were infected, some may have originated from spread in the seed-bed [cf. ibid., xvii, p. 80]. Secondary infection occurs in wet weather by the scattering in rain drops of the bacterial exudate from the cankers. This causes a superficial infection of the fruit in the form of small, raised spots with white haloes. This is the only type of secondary infection that has been observed in Kenya, and is quite different from the systemic infection.

Fermentation of the pulp for the extraction of seed as recommended by Blood [ibid., xxi, p. 353] gives almost complete control of the seed-borne infection, being more effective than hot water (one hour at 54° C.) or the mercuric chlorine treatment. In a trial at Nairobi the fermenting pulp was kept at 90° F. for four days, and although germination was slow, the percentage was only slightly below that of the freshly extracted seed.

Additional control measures suggested are the use only of sterilized soil, or that which has not grown tomatoes before, for seed-boxes or beds. Plants showing symptoms of *C. michiganense* should be removed and destroyed and should not be put on the compost heap. Diseased plants should be removed before pruning, or suspected plants left until pruning is finished. Frequent sterilization of the hands and of pruning knives should be insisted on. Only seed from plants from a plot inspected and certified free from the disease should be sown; and seeds from an unknown source should be grown in isolation from all other tomato plants until they are recognized to be free from disease.

Goidànich (G.). **L'Olmo Buisman.** [The Buisman Elm.]—*Boll. Staz. Pat. veg. Roma*, N.S., xxi, 3, pp. 270–286, 11 figs., 1941. [Received June, 1946.]

During 1939, 1940, and 1941, further inoculations of C. Buisman elms with *Graphium* [*Ceratostomella*] *ulmi* in Italy [*R.A.M.*, xxv, p. 528] again demonstrated the resistance of this variety to the disease, whether the trees were grafted on *Ulmus hollandica* or *U. pumila*.

Goidànich (G.) & Azzaroli (F.). **Relazione sulle esperienze di selezione di Olmi resistenti alla grafiosi e di inoculazioni artificiali di 'Graphium Ulmi' eseguite nel 1939–1940.** [Report on experiments on the selection of Elms resistant to graphiosis and on artificial inoculations with '*Graphium ulmi*' carried out in 1939–1940.]—*Boll. Staz. Pat. veg. Roma*, N.S., xxi, 3, pp. 287–306, 4 figs., 1941. [Received June, 1946.]

During 1939, 30 pure-line ungrafted *Ulmus pumila* trees were experimentally inoculated with *Graphium* [*Ceratostomella*] *ulmi* [see preceding abstract], some twice, others three times. None of the trees died, but nine developed slight transitory symptoms.

Of 18 *U. campestris* trees which had withstood inoculation in 1938, two withered in June, 1939; the rest were reinoculated in 1939 and of these four developed only slight symptoms of the disease even after two or three inoculations.

In 1938 scions of 19 plants of *U. campestris* selected for their resistance in inoculation experiments were grafted on to *U. pumila* stocks, and in 1939 parallel inoculations were carried out on these and on the parents. Infection on the young grafts was less severe than on the original plants. In 1940 the grafted trees were reinoculated, and on the whole the results were more serious. The variety Villafranca 8, however, appeared normal after four inoculations. Among the *U. campestris* trees selected in 1937, Villagrappa 3 continues to show resistance, even after five inoculations in 1939. Ten plants, produced by grafting this variety on to *U. pumila* stocks

and receiving the same treatment in 1939 and four reinoculations in 1940, showed only slight symptoms.

Borzini (G.). **Sulle cause di un deperimento di piantine di Cipresso.** [On the causes of a wilt of Cypress seedlings.]—*Boll. Staz. Pat. veg. Roma*, N.S., xx, 4, pp. 330–335, 4 figs., 1940. [Received June, 1946.]

In October, 1939, the author received from Tripoli a number of cypress [*Cupressus* sp.] seedlings showing stunted growth as a result of a wilt causing a characteristic curvature of the shoot tips, which showed the presence of the mycelium and spores of an *Alternaria* considered to belong to the *A. tenuis* group. The roots and the rest of the plant appeared to be healthy. On the host the conidia measured 16 to 34 by 6 to 18 μ. In culture they measured 12 to 38 by 6 to 15 μ (greatest frequency 21 to 23 by 9 to 11 μ).

Bier (J. E.) & Foster (R. E.). **Significance of conk rot on Sitka Spruce on Queen Charlotte Islands.**—Reprinted from *B.C. Lumberm., 1946*, May, 3 pp., 3 figs., 1 diag., 1946.

Of the 31 species of fungi contributing to the decay of Sitka spruce [*Picea sitchensis*] on the Queen Charlotte Islands, British Columbia, only *Fomes pini*, the agent of conk rot [*R.A.M.*, xv, p. 694], produced external fruit bodies whereby the internal rot could be recognized. The internal symptoms seldom extend far below the lowermost fructification visible on the trees. *F. pini* was responsible for 40 per cent. of the total loss through rot in the 1,977 trees examined in the course of the writers' investigations. An analysis of the importance of the fungus in relation to degrading of the wood in the 354 affected trees showed that averages of 97·8 and 89·2 per cent. of grades 1 and 2 were free from decay, compared with only 55·4 per cent. in grade 3. Trees with long rows of fruit bodies extending down to a height of 50 to 60 ft. above ground should be felled, since a high proportion of the first- and second-grade wood in the basal log will probably be sound. These observations are applicable exclusively to the disease as it affects *P. sitchensis*, as the causal organism may assume quite a different form in other west-coast species.

Robak (H.). **Nye undersøkelser over muggsoppers innflytelse på fruktlegemedannelsen hos Pholiota mutabilis.** [Further studies on the influence of the mould fungus on fruit body formation by *Pholiota mutabilis*.]—*Nyt Mag. Naturv.*, lxxxi, pp. 105–116, 1 graph, 1941. [English summary. Received September, 1946.]

Further experiments confirmed the results previously described (*Nyt Mag. Naturv.*, lxxvii, pp. 120–128, 1937) of tests in which the inoculation of the beer wort agar medium with *Penicillium expansum* led to the production by *Pholiota mutabilis* [*R.A.M.*, xv, p. 72] of normal fruit bodies, otherwise abortive or lacking. The mould presumably contains vitamins, hormones, or weak toxins which exert a stimulus on sporophore formation.

Van Wyk (J. H.). **Preservation of timber for the farm.**—*Fmg S. Afr.*, xxi, 243, pp. 377–382, 2 figs., 2 diags., 1946.

Timber to be prepared for creosote treatment in South Africa [*R.A.M.*, xxv, p. 378] should be cut from March to April, the bark stripped, the poles stacked in the open, and left to dry through the winter. A moisture content of 20 per cent., reached in four to nine months according to the size and variety of pole, should be retained. Free ventilation should be assured when stacking poles. The treating

plant required should be so constructed as to ensure safe heating of highly inflammable creosote over an open fire. Three plants which can be easily and cheaply constructed are described, and two of them illustrated.

BENNETT (C. W.) & MUNCK (C.). **Yellow wilt of Sugar Beet in Argentina.**—*J. agric. Res.*, lxxiii, 2, pp. 45–64, 8 figs., 1946.

The name 'yellow wilt' is given by the authors to a disease which has attacked sugar beets in the Rio Colorado and Rio Negro valleys of Argentina, probably ever since the industry was introduced there in 1929. In 1938–9 it caused an almost total loss of crop in the Rio Negro valley, and in 1941 sugar beet cultivation in this area was discontinued. There is some evidence that the disease also attacks garden beet and Swiss chard.

There are two phases of the disease. The first begins with yellowing and in two months most of the plants are stunted and yellow, conspicuously so along the veins. The leaves become thickened, brittle, and rolled, with some marginal and intervenal scorching, and assume an erect position. The plants remained in a fair condition, some showing slight growth of axillary buds; the tap-roots, however, were woody and the rootlets mostly dead. The second phase does not appear until the yellows phase is fully evident. Plants attacked at this stage wilt rapidly and usually die within a week. Occasionally growth was renewed with thick, folded, greenish-yellow leaves tinged with purple. The rootlets die at an early stage and the main root withers later.

Under greenhouse conditions the disease was induced by grafting diseased to healthy tissue and in a few cases by the dodder species *Cuscuta subinclusa* and *C. campestris* [cf. *R.A.M.*, xxiv, p. 136], but not by juice inoculation. The disease induced was always the yellows, never the wilt type. The leafhopper *Atanus exitiosus* is considered to be the vector of the causal agent. All field beet plants protected by insect cages remained healthy.

It appears, therefore, that there exists in this part of Argentina a virus which does little or no damage to native plants, but is dangerously pathogenic to imported sugar beet varieties; and even though the beet sugar industry has as yet no great importance there, such a disease must be regarded as of serious significance lest it should be introduced into other beet sugar-producing countries of the world.

HALE (J. B.), WATSON (M[ARION] A.), & HULL (R.). **Some causes of chlorosis and necrosis of Sugar-Beet foliage.**—*Ann. appl. Biol.*, xxxiii, 1, pp. 13–28, 2 pl., 1 graph, 1946.

This paper reviews the symptoms of common diseases of sugar beet due to beet yellows virus, beet mosaic virus, a secondary complication of downy mildew (*Peronospora schachtii*), magnesium, manganese, and potash deficiency, and the toxic effect of excess manganese, and describes the chemical, phytopathological, and field methods which have been employed to distinguish between them, notably in the practical diagnosis of atypical conditions and those complicated by the presence of two or more diseases. The material used came from field crops grown in eastern England. Virus tests were made by sap inoculation, aphid transmission, or serological methods, and mineral deficiency examined spectrographically. In deficiency tests, either the soil was amended with the element presumed to be deficient, or it was sprayed on to the plants, or injected into them by Roach's method.

Beet mosaic, though very common and usually found where seed crops are grown [*R.A.M.*, xxiv, p. 84], corresponds in distribution and frequency with beet yellows virus and both are transmitted by the aphids, *Myzus persicae* and *Aphis fabae*. It has little importance in Britain, but should be regarded as a distinct disease, unassociated with nutrient deficiency or beet yellows virus.

Beet yellows virus [ibid., xxii, p. 123] is a source of serious economic loss in sugar beet in Britain and the primary foliar symptoms of vein-clearing and superficial etch-like necrosis, followed by bright or orange-yellow, intervenal and basipetal chlorosis, with golden-brown necrotic tissue particularly at the margin and tip, may be accompanied by a secondary infection by *Sporodesmium* spp. Bright scarlet spotting in some varieties is considered diagnostic. The distribution and frequency of the disease depend on the behaviour of the aphid vectors and the presence of overwintering sources of the virus [ibid., xxv, pp. 135, 245]. Analyses made in 1942 showed that the magnesium content was consistently higher in infected than in healthy plants, and the differences varied with the degree and date of infection. In early-sown plants the magnesium content of infected specimens was 0·62 as compared with 0·48 per cent. in healthy plants, and for late-sown beet 0·72 and 0·48 per cent., respectively.

Downy mildew parasitizes chiefly seed and young root crops and the symptoms can be distinguished from virus yellows by the presence of vascular lesions in the veins or petioles, with the collapse of the xylem vessels, which become dark purple-brown, often visible through the superficial tissues. The lower leaf surface may have sticky, purplish lesions. The disease attacks seed crops more than virus yellows.

The chlorosis caused by magnesium deficiency is paler, the leaf surface more glossy, the demarcation between yellow and green more pronounced, the tissues less brittle, and the necrosis darker brown than in the case of yellows virus, but laboratory technique may be required for confident diagnosis in advanced cases. A comparative leaf analysis of plants treated by spraying or injection with magnesium sulphate offered little evidence that amendments with magnesium salts will reduce the chlorotic symptoms invariably associated with low magnesium content of the leaves, which may be due to several interacting factors. It is suggested that calcium may be required to control this condition. In all manurial experiments addition of agricultural salt [sodium chloride] increased magnesium deficiency symptoms.

The generally accepted symptoms of potash deficiency are apical and marginal necrosis and a dull, olive-green appearance of the leaf, which afford a striking contrast with those of yellows and magnesium deficiency, when all three disorders may be encountered at the same time of year, late in the summer. The results of experiments show that this condition can occur not only as a consequence of low potassium content of the plants, but also when the sodium content is low, even though that of potassium is high. The general conclusion is that the sugar beet plant can suffer from sodium deficiency, which may be accompanied to some extent by potash deficiency. The symptoms can be reduced by either element applied separately. The use of sodium invariably conferred a greater increase of crop dry matter per acre, and must be held to contribute to the amendment of a sodium shortage.

The chlorotic mottling in the intervenal areas of the leaf laminae, characteristic of primary symptoms of manganese deficiency (speckled yellows) [ibid., xviii, p. 266], is readily distinguishable from other chlorotic beet diseases. These lesions develop in May and June and form a feathery pattern of pale white-green, later developing into translucent, pinkish-buff, necrotic patches, of a horny texture, becoming more diffuse when the plants are beginning to recover, and rendering the condition less easily distinguishable from other chlorotic beet disorders. Experiments showed that it can be eliminated by spraying or injecting with manganese sulphate and reduced by soil applications of ammonium sulphate, potash, and salt, all of which increase the manganese content of the leaves.

A chlorosis of uniform pale yellowish-green, accompanied by stunting, upright habit, and marginal inrolling, was associated with excess of manganese in plants growing on soils with a pH value usually below 5, analysis showing that the

concentration of manganese was 10 to 30 times the average, while the calcium content was slightly higher than normal.

HADORN (C.). **Bohnenkrankheiten und Bekämpfungsversuche mit Saatbeizmitteln.** [Bean diseases and control experiments with seed disinfectants.]—*Forsch-Ergebn. Gartenb., 1944*, 4, pp. 3–33, 22 figs., 1 diag., 2 graphs, 1944. [Received 1945.]

None of the 13 disinfectants tested against the three chief seed-borne diseases of beans [*Phaseolus vulgaris*], anthracnose (*Gloeosporium* [*Colletotrichum*] *lindemuthianum*), grease spot (*Pseudomonas* [*Xanthomonas*] *phaseoli*), and leaf spot (*Ascochyta pisi*) at the Federal Experiment Station, Wädenswil, Zürich, gave complete control of the first-named pathogen and all were ineffectual against the bacteriosis. Ceretan [ceresan] dust (0·5 gm. per 100 gm. seed) proved useful in the elimination of *C. lindemuthianum* if applied when the seed coat only was involved, but once the hyphae had penetrated the cotyledonary tissues the outcome of the treatment was questionable, and by the time the deeper layers of the cotyledons were reached further measures were unavailing. The life-history of *A. pisi* is very similar to that of *C. lindemuthianum*.

The most reliable means of combating anthracnose and the bacterioses (in addition to *X. phaseoli*, *Bacterium* [*Corynebacterium*] (?) *flaccumfaciens* has been detected of recent years on the Ohnegleichen and Julibohne varieties) consists in the procurement of sound seed from uninfected pods, preferably from entirely healthy plantings; where the strict observance of the last-named precaution is impracticable, the pods at any rate must be disease-free. In suspicious or doubtful cases thorough sorting of the seeds, discarding any spotted ones, should precede treatment with a mercury-containing fungicide. Anthracnose, the bacterioses, *A. pisi*, and bean rust (*Uromyces appendiculatus*) can be more or less effectively held in check by two or three timely applications of a copper mixture with good adhesive properties, e.g., Bordeaux or copper-Sandoz to prevent stem and leaf infections, while the pods of crops grown for seed should be protected by two further treatments in July or August.

The ravages of anthracnose may be materially reduced by rational cultural measures. In Schaffnit and Böning's monograph on bean anthracnose [*R.A.M.*, iv, p. 456] mention is made of the favourable effects of potash and phosphorus on plant structure, the loose foliar system resulting from these elements in the soil affording ready access to sun and air, to which the site should be well exposed. Plant residues should be collected and burnt after harvesting, crop rotation practised, and the supports disinfected with 5 per cent. carbolineum after picking or at latest three weeks before further use, chiefly to destroy the resting spores of *U. appendiculatus*.

BLODGETT (E. C.). **Observations on blasting of Onion seed heads in Idaho.**—*Plant Dis. Reptr*, xxx, 3, pp. 77–81, 1946. [Mimeographed.]

Onion seed production is stated to have increased rapidly of recent years in south-western Idaho, but in many cases the yield has been drastically reduced by 'blasting' of the flowers after apparently normal bloom, resulting in their partial or total failure to fill out and set seed. Where two or more seed stalks arise from the same bulb, one or more of the heads may be perfectly filled out while the others are slightly or severely damaged. Some of the affected heads were found to be borne on stalks with pale, cankered lesions from which *Botrytis allii* [*R.A.M.*, xviii, p. 431] was consistently isolated. Although no inoculation experiments were carried out, the fungus on the stalks is believed to have been directly responsible for the injury to the heads. Onions raised from the same stock as that so heavily attacked by blasting in 1944 were virtually unaffected in 1945.

Biraghi (A.). **Damage apparently caused by Sclerotinia observed on salad crops in Italy.**—*Int. Bull. Pl. Prot.*, xviii, 7–8, pp. 49M–53M, 1944. [Received July, 1946.]

During 1941 and 1942 salad crops [? lettuces] of the varieties Trocadero and Incappucciata riccia growing at Barletta, Francavilla a Mare, and Pescara, on the Adriatic coast of Italy, showed severe collar rot, plants in advanced stages of rot invariably yielding *Sclerotinia sclerotiorum* [*R.A.M.*, xvii, p. 369; xxiv, pp. 2, 350] sometimes accompanied by *S. minor* [ibid., xix, p. 320]. *Botrytis vulgaris* [*B. cinerea*] was occasionally present on the shrivelled leaves as a grey-brown mould. The rot was present over a wide area in which conditions were very varied and the affected plants were usually scattered about in small groups, or isolated among healthy plants which did not contract the disease even when touching the diseased ones. During the early stages of infection, when the aerial parts showed withering or yellowing of the first basal leaves, no causal organism could be detected by isolation or by microscopic examination, but sections of the root at or below the collar showed the presence of yellowish-brown or purplish spots localized in the vascular tissue, the conducting elements of which were filled with gum. The damage was evidently due primarily to cold, and affected plants invariably succumbed to *Sclerotinia* later. It is recommended that a variety having a greater resistance to cold should be found. Meantime, the ground should be covered with straw or similar litter.

Biraghi (A.). **Un marciume della Lattuga prodotto da 'Pythium'.** [A Lettuce rot caused by '*Pythium*'.]—*Boll. Staz. Pat. veg. Roma*, N.S., xx, 2, pp. 119–124, 1 pl., 1 fig., 1940. [Received June, 1946.]

From the cortical tissues of the rotted primary roots of severely wilted lettuces which showed no tissue disorganization or any parasitic organism in the aerial parts, the author isolated a species of *Pythium*, inoculations with which into wounded and unwounded leaf bases of lettuces gave positive results, the fungus being re-isolated from the primary roots of the inoculated plants. In culture on various media the organism formed numerous spherical, rarely ellipsoidal terminal sporangia measuring 18 to 40 (mostly 30 to 32) μ in diameter. The oospores were 13 to 16 μ in diameter, had a smooth wall 1 to 1·5 μ thick, and almost completely filled the terminal oogonia. The antheridia were cylindrical or slightly club-shaped and monoclinous.

Andersen (E. M.). **Tipburn of Lettuce. Effect of maturity, air and soil temperature and soil moisture tension.**—*Bull. Cornell agric. Exp. Sta.* 829, 14 pp., 2 figs., 10 graphs, 1946.

Experiments are described, the results of which suggest that water deficiency, as shown by high soil moisture tension, is the primary cause of lettuce tipburn, thus confirming the conclusions of Beattie [*R.A.M.*, xx, p. 242] and earlier workers, while diverging from those of Thompson [ibid., vii, p. 422] and others.

Plants of the Imperial 44 variety of Iceberg lettuce were grown on two types of peat soil and tipburn was most severe when the difference between maximum air and maximum soil temperature was greatest. It increased as the moisture content of the soil fell. For any given difference between air and soil temperature tipburn would be most severe when soil temperature was lowest, unless both were so low that water loss from the plant would be low also. The greatest difference between air and soil temperature was noted when cool, damp weather was followed by a sunny, dry period. In such conditions it is thought that water absorption is too low to replace water loss and severe tipburn results.

The results of R. Schmidt (*Rep. N. C. agric. Exp. Sta.* 51, pp. 127–133, 1930), showing that days on which the percentage of tipburn increased noticeably were

always preceded by at least one day with a considerable difference between soil temperature and maximum air temperature, and that when the percentage was low days with small differences between maximum air temperature and maximum soil temperature preceded, are consistent with the results reported here.

HADORN (C.) & SCHÜTZ (F.). **Vergleichende Versuche zur Bekämpfung der Weissfleckenkrankheit der Sellerie.** [Comparative experiments in the control of Celery white spot.]—*ForschErgebn. Gartenb.*, *1942*, 1, pp. 16–23, 8 figs., 1 diag., 2 graphs, 1942. [Received 1945.]

Cuprenox (1 per cent.) was the most effective of the five copper-containing preparations tested against celery blight (*Septoria apii*) at the Wädenswil (Zürich) Experiment Station in 1940 [*R.A.M.*, xxiii, p. 90], raising the total weight of the heads from 32·7 kg. per plot of 6·35 by 1·17 m. to 140·2 kg., the corresponding weights for cupromaag, virikupfer, kukaka, and ropil being 117·7, 114·4, 96·5, and 85 kg., respectively. The outlay on cuprenox of Fr. 2·05 per 100 l., compared with Fr. 1·50 each for kukaka and virikupfer and Fr. 1·70 for cupromaag, is more than offset by the increased yield.

WAHLIN (B.). **Trollsmör i Gurkhus.** ['Fairy butter' in the Cucumber house.] —*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, *1946*, 2, pp. 28–29, 1 fig., 1946.

A very unusual fungal infection of cucumbers was reported in May 1946 from a market-garden near Linköping, Sweden, where the so-called 'fairy butter' (*Fuligo* sp.), originating in the stable manure of the hot-bed, had enveloped the bases of the fruits and even the lowest leaves. The growth of the plasmodium advanced 15 cm. along a cucumber stem in nine hours, besides attaining a massive volume. Although not actually parasitic, the slime mould assumed a very troublesome form, destroying several fruits before it was arrested by spraying the soil surface with 1 per cent. basic Bordeaux or 0·02 per cent. uspulun.

WAGER (V. A.). **Egg-plants resistant to bacterial wilt.**—*Fmg S. Afr.*, xxi, 243, pp. 410–412, 2 figs., 1946.

The Kopek variety of eggplant continues to show higher resistance to *Bacterium* [*Xanthomonas*] *solanacearum* than the Matale variety [*R.A.M.*, xxiv, p. 49]. These two varieties have been crossed with one another, and each with the variety Terong Gewok of Javanese origin and almost immune from wilt, but whose small, round fruits are useless. The F_3 progeny are highly promising.

MILLER (L. I.). **Peanut leafspot and leafhopper control.**—*Bull. Va agric. Exp. Sta.* 338, 24 pp., 7 figs., 1942. [Received July, 1946.]

The Virginian groundnut crop ranks fourth in quantity of production in the southern United States. The control of leaf spot (*Cercospora* spp.) [*C. arachidicola* and *C. personata*: *R.A.M.*, xxv, p. 58], the most common and destructive disease, is of great importance to local growers, and the results of the experiments reported in this paper show that three or four treatments with finely ground sulphur dust at fortnightly intervals will control both the *Cercospora* leaf infection [ibid., xxv, p. 333] and the leafhopper (*Empoasca fabae*) pest, which causes spasmodic damage. The inclusive cost of the treatment is about $3 per acre.

Three applications of sulphur dust at fortnightly intervals on 30 farms increased the average yield of groundnuts by 481 lb. per acre (range from 238 to 834 lb.). Tests on seven farms yielded increases in hay ranging from 526 to 3,419 lb. per acre. The nuts and hay of sulphur-dusted plants were of better quality, also they

mature some five to ten days later than untreated plants, and can be held in the ground longer without risk of serious loss through shedding, which is a distinct advantage where labour is short at harvesting-time.

MALIK (R. P.). **Collar rot of Pigeon Pea caused by Pythium aphanidermatum (Edson) Fitz.**—*Indian J. agric. Sci.*, xv, 2, pp. 92–93, 1945.

Isolations made at the Imperial Agricultural Research Institute, New Delhi, in 1943 from wilted pigeon pea (*Cajanus cajan*) plants of the U.P. 132 variety yielded a species of *Pythium*, *Macrophomina phaseoli*, a *Fusarium* distinct from *F. udum*, and *Corticium rolfsii* [*R.A.M.*, xxii, p. 154]. On potato dextrose agar the *Pythium* formed oogonia measuring 14 to 34 (mean 21) μ and oospores 12 to 29 (17), while the corresponding means for *P. butleri* and *P. aphanidermatum*, regarded as identical by Carpenter (*Bull. Hawaii Sug. Ass.*, Bot. Ser., iii, 1, 1921) and Mitra and Subramanian [*R.A.M.*, vii, p. 488], are given by Drechsler [ibid., xiii, p. 399] as 27 and 22·5 and 22 and 17·5 μ, respectively. The author's isolate is accordingly referred to *P. aphanidermatum*. Inoculations with the fungus on pigeon pea stems just above soil-level a few days after sowing caused desiccation of the foliage and young shoots, and in some plants of the collar region also.

STAEHELIN (M.). **Sklerotienkrankheit bei Zichorie.** [Sclerotial disease of Chicory.] —*ForschErgebn. Gartenb., 1942*, 1, p. 15, 1942. [Received 1945.]

Good control of the chicory wilt and soft rot caused by *Sclerotinia sclerotiorum* [*R.A.M.*, xvii, p. 293] and *S. minor* was secured in extensive plantings at Lausanne by the use of a well-balanced fertilizer with potash and phosphorus as the predominant constituents, nitrogen and organic manures being inadvisable. Both fungi are perpetuated from year to year exclusively by means of their sclerotia, which develop into mycelia under favourable moisture and temperature conditions and infect the roots of the new crop. Soil disinfection with formalin or mercury dusts and by steam sterilization have given good results. The disease is not seed-borne.

VENEZIA (M.) & RUI (D.). **Contributo sperimentale all' economia dell' impiego del rame in viticoltura. Sulle relazioni tra stato di combinazione del rame e sua attività biologica.** [An experimental contribution to effecting economy in the use of copper in viticulture. On the relations between the state of combination of the copper and its biological activity.]—*Boll. Staz. Pat. veg. Roma*, N.S., xxii, 2, pp. 87–118, 1942. [Received June, 1946.]

Microscopic observations on the germination of *Alternaria tenuis* spores treated with various materials in a variety of dilutions and at a range of pH values intended for use against *Plasmopara viticola* [see next abstracts] and containing only small amounts of copper showed that Burgundy mixture containing 1 per cent. copper was more active in preventing germination than Bordeaux mixture at the same concentration (pH 7·85 to 7·9). Bordeaux mixture 1 per cent. at 1 in 500,000 allowed germination, with the production of short promycelia, while Burgundy mixture permitted only incipient germination, and not of all the conidia. Three different types of products, all containing about 8 per cent. copper, showed different anti-germination activity of the copper ion. At 1 in 250,000, ramital [Casale's mixture: *R.A.M.*, xxv, p. 492] (cupro-organic) allowed incomplete germination, with very short promycelia, cupramina (cuprammonia) [ibid xxii, p. 287] permitted germination of some conidia with short promycelia, and Bordeaux failed almost completely to prevent germination with long promycelia. S.V. 4^a (copper bentonite) containing 1·64 per cent. copper was as active at 1 in 50,000 as a product containing a much higher proportion of copper.

Borzini (G.). **Considerazioni sulle poltiglie a rame ridotto diffuse nella campagna antiperonosporica 1942.** [Considerations on sprays containing reduced amounts of copper released for the campaign against Vine mildew, 1942.]—*Boll. Staz. Pat. veg. Roma*, N.S., xxi, 4, pp. 313–317, 1941. [Received June, 1946.]

The sprays containing reduced amounts of copper for use against vine mildew [*Plasmopara viticola*], the release of which was officially authorized in Italy during 1942, viz., ramital [Casale's mixture], cupramina, and ramato P1, had all been previously tested under official control in every part of the country, ramital for three years. All, particularly ramital, had shown themselves capable of affording the vines adequate protection, though containing appreciably smaller proportions of copper than ordinary Bordeaux mixture.

Borzini (G.). **Contributo allo studio di metodi pratici di analisi biologica e tecnica di anticrittogamici, con particolare riguardo a poltiglie da usarsi nella lotta contro la Peronospora della Vite.** [A contribution to the study of practical methods of the biological and technical analysis of fungicides, with special reference to sprays for use against Vine mildew.]—*Boll. Staz. Pat. veg. Roma*, N.S., xx, 4, pp. 253–299, 4 figs., 1940. [Received June, 1946.]

After a detailed description of the laboratory methods used by him for the preliminary testing of the fungicidal value of spray fluids (particularly of those destined for use against *Plasmopara viticola*), the author concludes that any spray mixture worthy of further consideration should, when tested by his methods, prove to be at least as fungicidal as ordinary Caffaro mixture [*R.A.M.*, i, p. 66; xviii, p. 124], while its residual activity after leaching by rain, etc., should approximate to that of ordinary neutral Bordeaux mixture, and be not less than that of Caffaro mixture. Preliminary laboratory tests can be made, when sporangia of *P. viticola* are not available, on spores of *Alternaria tenuis* [cf. ibid., xxiii, pp. 34, 35]. If the product under examination gives promising results against these two organisms and has adequate adhesive power, the properties of the dried residue should then be examined, particularly as regards its diffusibility in water, and its fungicidal action compared with that of 1 per cent. Caffaro mixture. Finally, its effect upon the host must be tested. If the outcome of all these tests is satisfactory, then the material can be tried in the field or vineyard.

Goidànich (G.). **La 'sfaldatura' della Vite.** ['Flaking' of the Vine.]—*Boll. Staz. Pat. veg. Roma*, N.S., xx, 3, pp. 213–230, 9 figs., 1940. [Received June, 1946.]

During recent years American vines in nurseries in various localities in Italy have developed a disease which reduces the vitality of the mother plants and also injures the suckers and layers destined for propagation. Milky-white spots appear on the nodes of the branches and suckers and gradually invade and encircle the whole internode. The tissues of the cortex become pulverulent and are easily carried away by wind or rain, while in severe cases the phloem and xylem become affected. On layers and adult vines the disease attacks the roots and collar, and spreads for 3 or 4 cm. along the branches at the base of the stem. In adult plants the flaking-away of the cortical tissues at the collar is very conspicuous, a great deal of detritus being formed.

The condition is due to a parasitic fungus whose mycelium is at first superficial but later spreads into the tissues, causing the disintegration. Isolations from affected material gave a fungus with hyphae either sinuous and narrow measuring 0·7 to 2 (average 1·3) μ in diameter, with few or no visible septa but many clamp-connexions, or mostly rectilinear, measuring 2·5 to 5 (average 3·9) μ in diameter, with visible septa and larger clamp-connexions 5 to 7·5 (average 5·6) μ in diameter. While the perfect stage was not observed, the vegetative stage strongly resembled

Fibrillaria [? *Psathyrella ampelina*: *R.A.M.*, ix, p. 12] in its morphological characters. If the fungus is later found definitely to belong to this genus, its parasitic nature will be confirmed.

Cook (M. T.). **Plant viruses and plant diseases. (A historical review.)**—v + 204 + 39 pp., Department of Botany, Louisiana State University, 1946. [Mimeographed.]

This work [cf. *R.A.M.*, xv, p. 108; xvi, p. 485; xviii, p. 197], designed to assist advanced students of viruses and virus diseases, is an historical review in which the author attempts to follow the development of every aspect of the subject up to the present time (1943). Its six chapters deal, respectively, with early work on the subject and the economic importance of virus diseases, theories as to their causes, the nature and properties of plant viruses treated comparatively with tabulated summaries, host reactions both external and internal, transmission, and control. The bibliography extends to 39 pages and a chronological record is appended.

Petri (L.). **Rassegna dei casi fitopatologici osservati nel 1942.** [Review of phytopathological records noted in 1942.]—*Boll. Staz. Pat. veg. Roma*, N.S., xxii, 3–4, pp. 197–244, 1942. [Received June, 1946.]

This report [cf. *R.A.M.*, xxv, p. 493] contains numerous items of phytopathological interest, of which the following may be mentioned. A number of proprietary materials containing little or no copper, tested for use against vine mildew (*Plasmopara viticola*) under field conditions, gave satisfactory results. The experiments showed that the fungicidal activity of copper towards *P. viticola* is sometimes increased by the addition of small amounts of zinc.

Plum leaves from Bolzano showed infection by *Polystigma rubrum* [ibid., xxv, p. 457], and carob (*Ceratonia siliqua*) leaves from Rome attack by *Phyllosticta ceratoniae* [ibid., vii, p. 557]. Lemon branches at Caserta were infected by *Phytomonas* [*Pseudomonas*] *syringae* [ibid., xxii, p. 311].

Leaves of *Quercus ilex* in Rome were infected by *Phyllosticta ilicina*. Chestnut fruits from Rome showed mummification due to infection by *Phoma endogena* [ibid., xviii, p. 572]. Elm leaves from Iesi showed the presence of *Taphrina ulmi* [ibid., xvi, p. 642].

Many cases of wheat foot rot near Rome following cold weather early in May were associated with *Fusarium culmorum*. *Septoria glumarum* [*S. nodorum*] attacked wheat at Piacenza.

Beans (*Phaseolus vulgaris*) in Rome showed leaf spot due to *Phaeoisariopsis* [*Isariopsis*] *griseola*. Green tomatoes showed an apical rot associated with a bacterium provisionally identified as *Phytobacter* [*Bacterium*] *briosii* [ibid., vii, pp. 9. 491] and species of *Fusarium* and *Penicillium*; as these organisms were present only in cracked fruits, the condition, though usually regarded as due only to physiological causes, is in this case attributed to infection.

Nineteenth Annual Report of the Commonwealth Council for Scientific and Industrial Research for the year ended 30th June, 1945.—164 pp., 1945.

Among the various items not previously noted, from the phytopathological portion of this report from Australia [cf. *R.A.M.*, xxiv, p. 402], 30 per cent. infection by yellow [leaf] dwarf virus disease [ibid., xxi, p. 430] is recorded on tobacco in plots containing over 3,000 plants, grown in an area where the crop had not been cultivated for some eight years. Stunting of plants was common, but the absence of other characteristic symptoms has led to a study of different types of dwarfing, in which further research on control of the insect vector, *Thamnotettix argentata* [ibid., xxi, p. 540], is being made.

In field tests on varietal resistance to potato leaf roll no differences in population found of the aphids, *Myzus persicae* and *Macrosiphum gei*, that suggested their preference for any particular potato variety as a feeding-ground. This suggests that differences in susceptibility are related to the reactions of the plant tissues to inoculation. A range of susceptibility was detected among the Australian varieties commonly produced. Bismarck proved most resistant to, and intolerant of, infection. Infected plants were severely dwarfed and produced so few seed tubers that tuber transmission was considered relatively ineffective.

It is considered that browning of flax [ibid., xxiv, p. 507] is an indication of extra quality, provided that growth conditions, prior to the waterlogging which seems to be necessary for browning development, are favourable. The fact that fibre from fields with browning is one or two grades better is attributed to the good supply of soil water at the critical time for fibre production, and to the arrest of growth and fibre development at what is regarded to be the optimum stage for harvesting flax.

Notwithstanding exceptional drought-created conditions in which tomato spotted wilt was virtually absent, the results of experiments on part of a field plot with a very mild strain of the virus, isolated in pure form by tissue selection on the sensitive indicator host, *Nicotiana atropurpureum*, showed that inoculation conferred protection only for the first few weeks. This was confirmed when the concentration of this mild virus in the juice of greenhouse-grown plants was found to decrease rapidly and almost disappear after some weeks. This virus scarcely affects yield.

Considerable damage in various tomato-growing districts throughout Australia has been caused by *Fusarium* wilt. *F. bulbigenum* var. *lycopersici* was isolated from the plants.

Veitch (R.). **Report of the Director of Plant Industry (Research).**—*Rep. Dep. Agric. Qd, 1942–43*, pp. 5–9, 1943; *1943–44*, pp. 5–10, 1944. [Received July, 1946.]

The Director's report for 1942–3 [*R.A.M.*, xxii, p. 163] records mosaic disease of Navy bean [*Phaseolus vulgaris*] as fairly widespread in Queensland but serious damage was caused in one crop only, where additional evidence has been offered that the disease is seed-borne. Anthracnose [*Colletotrichum lindemuthianum*], which had been extensive on this crop the previous year, was not observed in 1942–3.

A pathological condition in Epicure beans, somewhat akin to halo blight [*Pseudomonas medicaginis* var. *phaseolicola*], was investigated and inoculation with a suspension of bacteria from the Canadian Wonder variety, infected with that disease, reproduced it in Epicure.

Considerable losses of passion fruit resulted from *Fusarium* wilt disease [cf. ibid., x, p. 394], which occurs most frequently on acid soils. Lime amendments prior to planting apparently had little effect, as the young plants became heavily infected in 1943–4 and the adoption of a long-term rotation is considered now to offer the most practical means of reducing *Fusarium* infection of the soil.

An expansion of the ginger industry at Buderim and Eumundi was unfortunately accompanied by the appearance of an [unspecified] disease affecting the shoots and rhizomes of the plants, which were stunted, turned yellow, and eventually the aerial shoots died, the oldest being the first to succumb. Rhizome decay may vary from a faint, water-soaked discoloration to a wet, slimy rot, which may reduce the rhizome to a shell containing the remains of the vascular tissue. As a result of co-operation between the officers of the Department and the growers, a 'seed'-selection scheme was adopted which resulted in a satisfactory stand for 1943–4.

Late-planted maize in the Brisbane district was severely affected in 1942–3 and 1943–4 by wallaby ear [virus: ibid., xxi, p. 485] and a chlorosis resembling mosaic,

which caused stunting of the plants. The latter disease was successfully transmitted by insects.

Smith (J. H.). **Plant pathological investigations.**—*Rep. Dep. Agric. Qd, 1944–45*, pp. 15–16, 1945.

Among other information of phytopathological interest in this report [see preceding abstract] the following items are noted. *Fusarium* wilt of potatoes [cf. *R.A.M.*, xx, p. 340] caused serious losses in 1944 but was almost absent from the following spring crop. The fungus requires temperature and moisture conditions precisely suited to it and no large-scale attack develops otherwise. Calico disease of potato [? a strain of lucerne mosaic virus] has been recorded for the first time in the Lockyer district.

Two leaf diseases of carrot, *Macrosporium* leaf blight [*Alternaria carotae*] and *Cercospora* leaf spot [*C. apii* var. *carotae*: ibid., xxiv, p. 45; xxv, p. 23] caused considerable damage in the year under review, particularly in wet weather during the cool, winter months.

A tendency of Glen Retreat mandarins in the subcoastal areas to overbear, which can be overcome to some extent by careful pruning in winter and thinning the crop when the trees are carrying fruit, is thought to have some connexion with abnormal behaviour known as 'decline' [ibid., xxv, p. 498] in both young and old trees, when the leaves turn yellow and often curl at the tip; leaf fall and die-back follow. Trees usually recover temporarily if fruiting is prevented for one or two seasons and adequate manuring is given. Faulty nutrition may explain this phenomenon, but fertilizer treatment does not provide a complete solution. Mycorrhizal activity may be a factor: it is thought possible that depletion of the organic matter in the surface soil may be caused by cultural practices which tend also to force the roots downwards, depressing mycorrhizal activity and disturbing the nutrition of the trees in other ways.

At Stanthorpe die-back in apple trees has been increasing. Not only old, but some replanted or newly planted trees have been affected, and serious losses have occurred in seedling trees which have just begun to bear. Trees growing vigorously may be seen alongside others which have succumbed. The cause of the disease remains obscure.

Annual report of the Department of Agriculture, Jamaica, for the year ended 31st March, 1945.—14 pp., 1946.

This report [cf. *R.A.M.*, xxiv, p. 353] records, *inter alia*, a further serious decline in the banana industry due to the prevalence of Panama disease [*Fusarium oxysporum* var. *cubense*], leaf spot [*Mycosphaerella musicola*], and war-time commercial uncertainties, which led to the conversion of many plantations to the production of annual crops. Rehabilitation following the hurricane of August, 1944, was confined to the larger plantations, whereas after previous hurricanes the small growers had always shown the earliest recovery. Spraying against *M. musicola* on large properties requires considerable equipment but then becomes a matter of routine, whereas for the small owner it also involves a burden of additional labour. Neglect of spraying prior to visual evidence of the disease deprives many growers of the full benefit from the expense involved, and leads to discouragement.

In dealing with Panama disease again the small grower, having no fallow or new land or land free of bananas knows, when he replants, that he is likely to lose a high proportion of his crop from this disease, whereas the large grower can replant a portion of his former area with some assurance that his losses will constitute a relatively small percentage of the stand.

Bronze leaf wilt disease of coco-nuts [ibid., xxiv, p. 367] made slight progress east and west of the severely affected region, but apart from a small section to the east

the advance was negligible compared with that of recent years. New reports came from Cousin's Cove in Hanover and from Treasure Beach in South St. Elizabeth, where young palms were affected in an area where coco-nuts had been completely destroyed 80 years previously. No further extension occurred in eastern Trelawny. In continuation of the felling programme over 26,000 trees were destroyed, many of which were in Hanover areas not cleared the previous year.

In the course of experiments on the susceptibility of sugar-cane varieties to mosaic disease, the following were found to be resistant: B. 39229, B. 40100, B. 40102, B. 40105, B. 40108, B. 40116, B. 40164, M. 270, M. 275, Co. 290, Co. 352, Co. 413, Co. 421, Co. 432. The following contracted slight mosaic: B. 4029, B. 4091, B. 4099, B. 40152, Co. 419, Co. 331. Average susceptibility to mosaic was shown by B. 39171, B. 4096, B. 4097, B. 4098, B. 40112, B. 40126, B. 40130, and Co. 299. Highly susceptible were B. 3915, B. 40114, B. 40117, B. 40133, B. 40174, Co. 231, Co. 313, and Co. 360.

Marked outbreaks of eye spot (*Helminthosporium sacchari*), which is favoured by poor soil and humidity, developed on some plantations during the winter, the variety P.O.J. 2878 being very susceptible while B. 34104 may show heavy infection as well. Only ripening cane is attacked and the economic loss caused by this disease is small.

A leaf spot associated with what appears to be a *Phyllosticta* sp. is generally observed on loofahs [*Luffa* sp.], but only certain varieties are seriously affected.

The following diseases were recorded for the first time in Jamaica: *Cercospora calotropidis* causing leaf spot of *Calotropis procera* [ibid., xi, p. 719]; maize stalk rot (*Pythium aphanidermatum*); cowpea anthracnose (*Colletotrichum capsici*) [ibid., xxi, p. 363]; edua bean (*Stizolobium* [*Mucuna*] sp.) leaf spot (*Cercospora stizolobii*) [cf. ibid., xix, p. 692]; *Cerebella cenchroides* on guinea grass (*Panicum maximum*) inflorescences; jasmine (*Jasminum grandiflorum*) leaf spot (*Cercospora jasminicola*); loofah downy mildew (*Pseudoperonospora cubensis*); oak mildew (*Microsphaera* sp.); and a die-back of guango [*Samania saman*] in certain dry areas on the southern plains in which the trees remained leafless, though the main branches did not die, apparently caused by drought.

Botany and plant pathology section.—*Rep. Ia agric. Exp. Sta., 1941–42*, Part I, pp. 140–158, 4 figs., 1 graph, 1942. [Received July, 1946.]

The following items of interest are not recorded in subsequent reports received earlier [*R.A.M.*, xxiv, p. 356]. H. C. Murphy states that the outbreak of crown rust of oats [*Puccinia coronata*] in 1941 was one of the worst ever recorded in the south-central and Great Lakes States. The disease caused a 30 per cent. reduction in the Iowa oat crop. A survey of oat diseases in the state from 1935 to 1941 shows that *P. coronata*, smuts [*Ustilago avenae* and *U. kolleri*], and *Pythium* [*debaryanum*] root necrosis [ibid., xxv, p. 108] were the sources of most damage. The Boone variety offered considerable resistance to the last-named.

G. Semeniuk and I. E. Melhus report that a species of *Phoma* isolated in early June from onion roots showing pink root rot [*P. terrestris*: ibid., xix, p. 328] was found to be either non-virulent to onion seedlings or mildly so.

Pythium cultures predominantly were obtained early in June from onion crops grown from sets on muck soil in the field, several of the plants showing obvious leaf necrosis from the tips downwards, while the roots remained apparently healthy. The high pathogenicity of most of these isolates to onion seedlings was shown in greenhouse tests in steamed soil. One culture tentatively determined as *P. irregulare* caused 100 per cent. pre-emergence death of Yellow Danvers and Southport White Globe seedlings. *P. debaryanum*, isolated from maize roots, was highly virulent to onion seedlings. Seed treatments gave no protection.

G. C. Kent and I. E. Melhus, in the course of apple-disease studies, showed that

Bacillus amylovorus [*Erwinia amylovora*: ibid., xxiii, p. 26] was unable to utilize nitrogen in the form of nitrates, ammonium salts, or amino acids with glycerine or dextrose as a source of carbon. It is suggested that it may be able to utilize amino nitrogen when the amino acid provides also the source of carbon.

During investigations by I. E. Melhus, J. N. Martin, and H. C. Murphy on the influence of Pythiaceous and other fungi on seedling stands of wheat, barley, rye, flax, lucerne, and cowpeas an experiment was carried out in which these crops were planted in April on an acid Buckner sandy soil, part of which had been treated in the preceding September with 480 lb. chloropicrin per acre [ibid., xxiii, p. 331]. Germination was from 3·5 to 18·8 per cent. (average 12·3 for all crops) better in the treated than in the non-treated soil and stand counts four weeks after planting were from 16·3 to 122·8 per cent. higher on the treated soil. Increases in green weight up to 328·6 per cent. (average 84·97) and in dry weights from 28·6 to 471·2 per cent. (average 204·7) were recorded.

Botany and plant pathology section.—*Rep. Ia agric. Exp. Sta., 1944–45*, Part I, pp. 185–223, 17 figs., 1 map, 1945.

The following subjects of phytopathological interest are mentioned, *inter alia*, in this report [cf. preceding abstract].

I. E. Melhus and C. S. Reddy, with a view to testing resistant strains of melons [*R.A.M.*, xxv, p. 25], released to growers in 1944 Early Resistant Queen, Black Kleckley, Kleckley Hybrid, and Dixie Hybrid seed, extensive plantings of which were made in the spring of 1945.

H. C. Murphy states that root necrosis (caused primarily by *Pythium debaryanum*), crown rust [*Puccinia coronata*], and halo blight [*Pseudomonas coronafaciens*] were in that order the most destructive diseases of oats in Iowa in 1944, root necrosis causing a reduction in yield of 15 per cent., and the other two 3 per cent. The loss from crown rust would have been negligible had it proved possible to plant the whole acreage under oats with the new resistant varieties, Tama, Boone, Control, and Marion. In the collections of crown rust races examined at the Station in 1944, more than usual of those to which Bond is susceptible were identified. This is important in view of the distribution of new varieties, such as Clinton and Benton, inheriting the Bond type of resistance. Mutica Ukrainia [ibid., xxiv, 273], Santa Fe No. 1 [ibid., xxi, p. 184], and Uruguay Landhafer represent first-class sources of resistance to the races of crown rust capable of infecting Bond and Victoria.

Anthracnose of oats [*Colletotrichum graminicola*] was reported for the first time in the State, certain Bond-hybrid selections being apparently the most susceptible.

In comparative experiments set up by I. E. Melhus and C. S. Reddy in the summer of 1944 for assessing the amount of stem rot [*Fusarium batatatis* and *F. hyperoxysporum*] in sweet potatoes grown from vine cuttings and slips [ibid., xxiii, p. 93], vascular discoloration was taken as the criterion of stem-rot infection. Shoemaker variety plants, propagated from slips, showed 18 per cent. infection and those from vine cuttings only 4. The Nancy Gold variety showed little difference (7·9 and 8·3 per cent., respectively, for cuttings and slips) between the two. In 1945 the percentage of stem rot recorded in late June was 0·7 for Shoemaker vine cuttings and 5·9 for slips, and 0 and 0·2, respectively, for Menintico. Nutritional tests with Nancy Hall variety showed an appreciable reduction of stem rot in plots treated with heavy potash and manure dressings.

G. Semeniuk and I. E. Melhus, in the course of studies of pink rot [*Phoma terrestris*], bulb rot *Fusarium* [*? oxysporum*], and other onion diseases, found wide variations in stand counts during seed-treatment tests in the peat soils of northern Iowa.

Bacteria characteristic of *Phytomonas alliicola* were isolated from the necrotic tissues of mature onion bulbs attacked by neck-rot disease during 1943. Onion

plants were successfully inoculated only by hypodermic injections in the necks or the green leaf tissues. In steamed and unsteamed soil the bacteria retained their capacity for infection for over 30 days.

I. E. Melhus and G. C. Kent report that further experiments on soil treatments with chloropicrin [see preceding abstract] at the rate of 400 lb. per acre showed that oats, wheat, barley, flax, and peas all benefited, particularly through increased root growth, the plants being nearly twice as large as, and much darker green than, those in untreated plots. The treatment had little effect on emergence, but the green weights of peas and flax at harvest were more than doubled and the seed yields of flax and barley considerably increased.

In the report on the testing of new potato hybrids for resistance to tuber and soil-inhabiting pathogens G. C. Kent, C. S. Reddy, I. E. Melhus, and W. J. Hooker note that the seedling AOB/4 continues immune from *Phytophthora infestans* but is extremely susceptible to scab [*Actinomyces scabies*]. Some seedlings exhibited a considerable measure of resistance to both, but seedling 46952, though fairly resistant to scab, became a total loss from *P. infestans*.

Hindenburg 627–216 and 528–34 were among the varieties showing the least infection in the 1943 tests. Less scab and higher potato yields followed the growing of rye immediately after digging the 1943 crop than from plots not so intercropped. Autumn ploughing appeared to give better yields and less scab than spring ploughing. Greenhouse tests with pure cultures of *A. scabies* in steamed peat showed that strains from commercially grown red beets are highly virulent to potatoes; that symptoms resembling those caused by *Rhizoctonia* [*Corticium*] *solani* can be induced; and that lesions on aerial parts [of potato plants] and damping-off of lettuce, radish, and other seedlings can be caused. Uniform growth was noted in a pathogenic strain of *A. scabies* only from pH 5·0 to 8·5. In steamed peat at 90 per cent. water-holding capacity and pH 6·5 the optimum growth of *A. scabies* occurred at 30° C., minimum at 0°, and maximum at 35 to 40°.

S. M. Dietz records the widespread presence of the oak wilt fungus, *Chalara quercina* [ibid. xxiv, p. 79], in Iowa in 1944 and its isolation from *Quercus borealis maxima*, *Q. ellipsoidalis*, *Q. macrocarpa*, and *Q. velutina* in the field and from greenhouse-infected plants of these and *Q. palustris*, *Q. prinus*, *Q. alba*, and *Q. imbricaria*.

H. C. Murphy, I. J. Johnson, and C. S. Reddy found root necrosis (*Pythium graminicola*) and other root diseases mainly responsible for an estimated decline of 60 per cent. in the barley production of Iowa in 1944, and much damage resulted also from *Helminthosporium* spot [? *H. sativum*] and net blotch [*H. teres*]. Observations on 4,248 barley varieties and selections from the Bureau of Plant Industry grown at Ames in 1944 showed that some 200 of these were free from symptoms caused by root diseases. Those which showed the symptoms yielded *Pythium graminicola* and *H. sativum*. Unnamed selections from the crosses Wisconsin 38 × Chevron, Velvet × Peatland, and Glabron × Peatland were most resistant to *H. sativum* in greenhouse tests, as were Manchuria and some of its strains and C.T. No. 4447. Many selections from crosses involving Chevron and other varieties resistant to *Erysiphe graminis hordei* showed high resistance.

In the course of his report on studies of soy-bean diseases and their control G. C. Kent states that the bacterial organisms, *Xanthomonas phaseoli* var. *sojense*, causing bacterial pustule, and *Pseudomonas glycines*, the agent of bacterial blight, were destroyed after seven weeks in culture solution at 10° F. in freezing tests, though they tolerated 13 weeks at this temperature when dispersed in steam field soil. Buffered potato dextrose agar is essential for the successful isolation of these pathogens from seed or from any aerial part of the plant. In experiments on seed treatments, using Lincoln of high germinability, only new improved ceresan at ½ oz. per bush gave highly significant increases in stand. At 1 oz. per bush. it was highly injurious.

Report of the Federal Experiment Station in Puerto Rico, 1945.—62 pp., 1946.

In the section of this report [*R.A.M.*, xxiv, p. 495] dealing with plant introduction (p. 34) D. G. White, M. Cobin, and E. P. Hume announce the opening of a rubber (*Hevea brasiliensis*)-breeding garden in co-operation with the United States Bureau of Plant Industry, the eventual lay-out of which is intended to provide the largest number of possible combinations with 12 of the highest-yielding and most disease [*Dothidella ulei*]-resistant Ford-Brazilian clones [ibid., xxiii, p. 455] yet to be added.

P. S. Roboles, Noemi G. Arrillaga, and Merriam A. Jones report no increase in stands of Chinese ginger following fungicidal seed piece treatments to decrease [unspecified] rot.

Wormald (H.). **Physiologic races of the crown gall organism in Britain.**—*Trans. Brit. mycol. Soc.*, xxviii, 3–4, pp. 134–146, 2 pl., 1945.

A tabulated description is presented of inoculation tests and experiments with the crown gall organism (*Bacterium tumefaciens*) carried out during the last 25 years at the East Malling Research Station, using isolates obtained from apple, bramble, dock (*Rumex crispus*), hollyhock, loganberry, raspberry, runner bean [*Phascolus multiflorus*], and *Schizanthus*. The general conclusion drawn from these studies is that within the species *Bact. tumefaciens* in Britain there are four physiologic races with different host relationships and habit in culture. (1) The daisy (*Chrysanthemum*) type, considered to be apparently similar to the original strain of *Bact. tumefaciens*, readily infecting Paris daisy (*C. frutescens*), produces medium-sized galls on tomato and raspberry, rarely on apple, and gives no definite acid reaction in lactose media. (2) The dock type (including raspberry and probably a loganberry isolate) does not infect Paris daisy but produces large galls on tomato, apple, and raspberry. It gives a marked acid reaction in lactose media (an acid curd in milk). (3) Other isolates are non-pathogenic on Paris daisy and induce small galls on tomato and usually a little acid in purple lactose agar but not in milk. (4) On apple stems isolates of *Bact. tumefaciens* from apple and pear produced only small galls or none at all, and negative results on other hosts inoculated; they developed acid in media containing sugar (sucrose, dextrose, or lactose), and an acid curd in milk cultures.

Tumours apparently of the crown-gall type were also collected at East Malling in the course of these investigations on hops, beetroot, marigold, melon (leaves), *Scolymus*, *Dahlia*, *Phlox*, *Chaerophyllum bulbosum*, *Eucalyptus* sp., lupin, and other plants.

That two of the strains should have been isolated from a common weed (*R. crispus*) and a hedgerow plant (bramble) is thought significant, as such plants may serve as unsuspected hosts of *Bact. tumefaciens*.

Starr (M. P.). **The nutrition of phytopathogenic bacteria. II. The genus Agrobacterium.**—*J. Bact.*, lii, 2, pp. 187–194, 2 graphs, 1946.

Continuing his studies on the nutritional requirements of phytopathogenic bacteria [cf. *R.A.M.*, xxv, p. 292], the writer corroborated previous observations on the capacity for growth in a medium containing ammonium chloride, other inorganic salts, and separately sterilized purified glucose of *Agrobacterium* [*Bacterium*] *radiobacter* [ibid., xx, p. 247]. *A.* [*Bact.*] *tumefaciens* [ibid., xxi, p. 130], and *A.* [*Bact.*] *gypsophilae* [ibid., xxv, p. 292]. The failure to develop in this medium of *A.* [*Bact.*] *rhizogenes*, *A.* [*Pseudomonas*] *rubi* [loc. cit.], and *Bact. pseudotsugae* [loc. cit.] was traced to the obligate nutrilite demands of these organisms, biotin and glutamic acid being essential to *Bact. rhizogenes*, biotin, nicotinic acid, calcium pantothenate, and glutamic acid to *Bact. rubi*, and biotin and an as yet undetermined compound

of 'vitamin-free' casein hydrolysate to *Bact. pseudotsugae*. The application of these results to the taxonomy of the group is briefly discussed.

Verona (O.). **Qualche osservazione sulla fase 'R' di Bact. tumefaciens Smith et Townsend.** [Observations on the 'R' phase of *Bacterium tumefaciens* Smith & Townsend.]—*Ann. Fac. agr. Pisa*, N.S., iv, 19, pp. 525–533, 2 figs., 1941. [French, German, and English summaries. Received August, 1946.]

When a virulent culture of *Bacterium tumefaciens* was grown on meat agar to which lithium chloride, lithium nitrate, or lithium sulphate had been added in amounts containing from 0·05 to 0·5 per cent. of the element, variant strains developed. On plain meat agar the colonies were of the smooth ('S') type [*R.A.M.*, xiv, p. 154], mucose, raised, translucid, semi-transparent, and with a continuous outline, whereas on meat agar plus lithium they were of the rough ('R') type, rugose, dry, flat, and with a sinuous-lobate outline. The S colonies gave marked production of mucus. In peptone broth they produced a slight homogeneous turbidity and formed a thin pellicle. In meat agar plus phenic acid growth took place when 1 per cent. of the acid was present. Suspension was normal in solutions of sodium chloride (0·85 per cent.) and copper sulphate (1 per cent.). No agglutination took place in the presence of tripaflavine 1 per mille. The rough colonies, on the other hand, produced more turbidity in liquid cultures, and formed a ring instead of a pellicle. Little, if any, production of mucus occurred. In meat agar with 1 per mille phenic acid growth was slow, difficult, or lacking. Only slight agglutination took place in solutions of 3·5 per cent. sodium chloride and 1 per cent. copper sulphate, while marked agglutination occurred in the presence of tripaflavine 1 per mille. The rough phase was less markedly Gram-negative than the smooth and was shown by inoculation tests to be much less virulent. The variants on lithium agar were not fixed and when transferred to ordinary meat agar quickly reverted to the smooth phase.

Woods (M. W.) & Du Buy (H. G.). **Seasonal changes in biological equilibria involving two chondriosomal systems in variegated Hosta.**—*Phytopathology*, xxxvi, 6, pp. 472–478, 2 figs., 1 diag., 1 graph, 1946.

The white, variegated areas in *Hosta japonica* at College Park, Maryland, were shown to arise from the presence of colourless plastids multiplying at rates different from the normal plastids in the heterochondric cells comprising both types [cf. *R.A.M.*, xxiii, p. 163]. In spring- or autumn-formed foliage the variegation-inducing plastids apparently inhibited the reproduction of the normal ones in heterochondric cells, resulting in pronounced variegation, whereas during the heat of summer the symptoms in the successively developing leaves were 'masked'. The vascular leaf tissues influenced the adjacent mesophyll in such a way as to provoke the frequent multiplication of normal plastids at the expense of those responsible for variegation, irrespective of the season.

These relationships are comparable with the interactions between a virus and the chondriosomal system of an infected cell, and since plastids may be considered specialized mitochondria the results suggest affinity to certain animal neoplastic diseases.

Voelcker (O. J.). **Annual Report West African Cacao Research Institute. April 1945–March 1946.**—58 pp. [1946. Mimeographed.]

The following items of phytopathological interest occur in this comprehensive survey of cacao research in West Africa [cf. *R.A.M.*, xxv, p. 440].

The marked tendency for new strains of virus organisms to be recorded from fresh isolated outbreaks of [cacao swollen shoot] virus disease will, it is hoped, decline with the completion of the Cacao Reconnaissance Survey. Mild strains are

known from the Ivory Coast, the Western and Eastern Provinces of the Gold Coast, Ashanti, and Togoland and are characteristic of the Nigerian outbreaks [ibid., xxv, p. 494]. Virulent strains are concentrated mainly in the Eastern Province of the Gold Coast, with localized centres in Ashanti, the Western Province of the Gold Coast, and the Ivory Coast.

The most noticeable feature of the mild virus infections [ibid., xxv, p. 293 *et passim*] studied is the rarity of dead trees. There is either no sign of virus infection or merely a slight deterioration in the canopy. Leaf symptoms, if present, are mild mosaic, flecking, fine vein-clearing, and 'fern' patterns, while severe chlorosis and crinkling are rare. Swellings are usually prominent. Two new strains, one discovered at Mampong on the Akwapim Ridge and the other in western Ashanti, differ greatly from one another and from all known Gold Coast strains. The Mampong strain is the most infective yet encountered, seedling symptoms appearing about three weeks after budding. The acute symptom, that of yellow veinbanding or sometimes complete yellows, is most prominent on leaves developing immediately above the bud and least on those on the opposite side of the stem. It is mostly confined to one leaf-flush, later ones being healthy except for slight general chlorosis. Large swellings develop later. The Ashanti strain requires about three months to produce, in graft-infected seedlings, symptoms expressed as clear, yellow bands following the primary veins, sometimes with severe crinkling and tearing as the leaf hardens. The leaves are darker green than normal and without any dwarfing. It resembles the strain found in the Yakasse district of the Ivory Coast [loc. cit.] more closely than the Gold Coast strains.

The first series of insect transmissions [ibid., xxiv, p. 307] suggests that virus strain A may represent a complex of at least two strains. *Ferrisiana virgata*, in addition to transmitting the complex, infected seedlings with a strain similar to B. *Pseudococcus njalensis* [ibid., xxv, p. 206] transmitted a strain which caused mosaic but not swellings. Coppicing trials and resistant selection tests suggest the instability of the virulent strain A, which would point either to its complex nature or to ease of attenuation. In either case a knowledge of the relationships between mild and virulent strains is essential for future work. Their relative distribution suggests the derivation, by synthesis or mutation, of the virulent from the mild strains. The elimination of the latter would then become necessary.

The results for 1945–6 of the immunization experiment begun in 1942 show that the mean yields per tree (in pods) were 15·2, 18, 8·3 and 0·2 for uninfected and those infected with strains B, C, and A, respectively, a difference of five pods per tree being statistically significant.

Observations at a site of 8¼ acres of typical mature trees, exposed to attack by strain A, showed that at the beginning in August, 1945, one-third of the trees were infected. By March, 1946, the number of healthy trees was reduced by 10 per cent. The yields (in pods per ¼-acre plot) ranged from 428 where 80 to 100 per cent. of the trees were infected to between 1,229 and 1,405 for 0 to 40 per cent. infection. Rate of spread of the same strain is also shown by records taken in two areas near Osino in the Eastern Province of the Gold Coast, where at Domi some 120 trees were diseased in 1941 and by 1945 about 10 acres were infected, while at Nsutum an outbreak covering 0·05 per acre in 1941 increased to 3·5 in less than five years. On an observation plot at the Unit Farm, Abetima, near Dawa, Krobo, the radial spread of an outbreak due to strain H had in 1942–3 infected, but not killed, five trees, the number of healthy trees being 229. By 1945–6 81·6 per cent. were infected of which 52 were dead.

During the year 8,124 seeds from plants infected with strains A, B, C, BC, or CB, were germinated and none showed signs of virus disease, thus bringing the total of seeds tested up to 17,767.

Observations on the effect of coppicing showed that the survival rate of healthy

trees when coppiced is high; diseased trees, however, mostly die fairly quickly and too many continue a temporary existence for this to constitute an effective method of control.

The continued selection of potentially resistant material has resulted in the segregation of about 20 clones worthy of further investigation of which six appear highly resistant. Selection SS. 167 is infected by a mild virus, possibly an attenuated form of strain A, which has apparently 'immunized' it.

New outbreaks in the original 60 acres at Tafo have occurred at the same rate as during the past four years. With the discovery that young nymphs (1st and 2nd instars) of *P. njalensis* can transmit the virus and are wind-borne, the random and widespread extension of swollen shoot can be attributed to the wind dispersal of the vector. Assuming that the radial spread of outbreaks is stopped if there is no new infection after six months, 17 outbreaks have been controlled completely during the year ending September, 1945, while 30 are still active. Replanting of cacao subsequent to the removal of diseased trees has been accompanied by infection only on a very small scale.

In insect transmission experiments *Toxoptera coffeae* and *Mesohomotoma tessmanni* failed to transmit strains A, B, C, D, and F; while *P. njalensis* and *F. virgata* transmitted strain A (the former infecting four plants out of 20, and the latter nine), but not apparently C or F. Adults, nymphs, and crawlers of *P. njalensis* transmitted strain A after less than four hours' feeding on leaves, shoots, or bark of infected plants. Maximum infection (80 per cent.) followed after feeding on young leaves for 48 hours. Plants infested with vectors four or five days after the hardening of the flush leaves develop virus symptoms most quickly, that is, in 17 days, the shortest incubation period recorded for strain A. *P. njalensis* transmitted strain D to seven out of 20 plants.

Investigations of capsid damage alone and when associated with *Calonectria rigidiuscula* [ibid., xiv, p. 397] showed that the fungus is associated with capsid lesions only on hardened stems. Capsid punctures subsequently infected by the fungus become deep-seated cankers with extensive discoloration of the xylem and toughening of the bark, whereas uninfected punctures show none of these features. The presence of *C. rigidiuscula* is also considered to be associated with the destruction of the older wood in die-back formerly attributed entirely to capsid attack. Hardened shoots half to completely ringed by capsid damage but not infected by the fungus showed no arrested growth, but of those infected nearly half died.

It has been demonstrated by artificial inoculation with pure cultures that *C. rigidiuscula* can be established in healthy wounded cacao trees but its subsequent spread is very slow. If, however, the trees have been weakened by drought or intensive capsid attack invasion is rapid and a conspicuous form of die-back results.

All the three types of *C. rigidiuscula* spores are commonly produced in the Gold Coast. Of the two conidial states (*Fusarium decemcellulare* [loc. cit.]), the microconidia form on the mycelium which sometimes overgrows recently infected tissue, particularly capsid lesions on green stems. The macroconidia are borne on small, emergent, pinkish-buff sporodochia on recently dead stems. Perithecia of the same colour occur in groups on small stromata on stems long dead, and also emerge through cracks in the bark.

MONNIER (P.). **Une nouvelle maladie à virus du Cacaoyer en Afrique occidentale : le swollen shoot.** [A new virus disease of Cacao in West Africa: swollen shoot.]—*Rev. Bot. appl.*, xxvi, 283–284, pp. 166–173, 1946.

After briefly reviewing the history of cacao swollen shoot in West Africa [see preceding and next abstracts], the author describes the symptoms of the disease, its mode of transmission, the losses sustained, and control. Fortunately, not all the forms of the disease found in the Ivory Coast are of a serious nature. No infected

plantation has yet been definitely reported in French Togoland [*R.A.M.*, xxv, p. 441].

Mangenot (G.), Alibert (H.), & Basset (A). **Sur les caractères du 'swollen-shoot' en Côte-d'Ivoire.** [On the characters of swollen shoot in the Ivory Coast.]—*Rev. Bot. appl.*, xxvi, 283–284, pp. 173–184, 3 pl., 1946.

In this amplified account of swollen-shoot symptoms in cacao trees in different parts of the Ivory Coast [*R.A.M.*, xxv, p. 295 and preceding abstracts] the stem swellings are described as never exceeding twice the diameter of the normal, adjacent segments. The swellings are either solitary, in short chains, or confluent, of varying length, always attenuated at both extremities, and often localized under the necrosed remains of a terminal bud. Histologically, they are characterized by cambial hyperplasia, an excessive development of the wood and phloem, and anomalies of thickening. The characters of the swellings appear to be the same in all parts of the Ivory Coast. In the Kongodia area [ibid., xxv, p. 440], the leaves on affected trees are mostly very small, but curled leaves are rare, although apical necrosis and curving are found. Affected leaves are usually of normal suppleness, though the curved leaves are brittle. A widely varying number of leaves are streaked, as if by mosaic; some areas are normal green, others pale, or yellow, or colourless. At Sankadiokio the diseased leaves are also much reduced in size, but the mosaic is of a different type. The white parts, in which the leaf is rigid and brittle, often appear to develop necrosis. When dried, these leaves turn black. The parts that are green when alive, after drying, become yellowish-green, in contrast to the greyish-green of normal leaves when dried.

Russell (R. C.). **Testing seed for smut spores as an aid in controlling cereal smuts in Saskatchewan.**—*Sci. Agric.*, xxvi, 8, pp. 372–380, 1946.

This paper summarizes the results of six years' tests, by the centrifuge method, of cereal seed-grain for covered smut [*Ustilago hordei*, *U. kolleri*, and *Tilletia caries*] spores [*R.A.M.*, xx, p. 566; xxii, p. 55]. During this time the method has been used commercially for large-scale tests of seed for farmers. The six years' records show that some 80 per cent. of the wheat, 30 of the oats, and 26 of the barley tested were free from smut spores, and thus did not require treatment against covered smuts. At the same time it is pointed out that the presence of other seed-borne organisms, such as *Helminthosporium sativum* [ibid., xxiii, p. 173] and *U. nigra* [loc. cit.], may necessitate seed treatment.

During the last four years seed tested in the commercial laboratory was grown in field plots to compare infection in plants from this seed and in ordinary field crops. The results indicate that it is safe in Saskatchewan to sow untreated seed carrying no more than a trace of smut, as seed in this class never gave more than an average of 0·25 per cent. infected heads, provided that other dangerous seed-borne parasites are not present and that it is of sound quality.

Considerable variation was noted in the amount of smut which develops in crops grown under similar conditions of growth, from seed carrying equal spore-loads of smut. This seems to depend on the variety of the host, the physiologic form of the fungus, the concentration of inoculum, and other factors. In barley and oats, the prime factor may be the extent to which the mycelium has developed under the hulls of the grain [ibid., xix, p. 697].

That *U. hordei* and *U. kolleri* are more prevalent in the black- than in the brown-soil areas of the province may be due to higher moisture in the former favouring mycelial development in the grain. On the other hand, bunt of wheat is more prevalent in the brown-soil zone.

The presence of *U. nigra* complicates the problem of testing barley seed, because most of the loose spores are blown away before the grain is threshed, yet there may

be considerable mycelial development in the seed coat. When infection is suspected seed treatment should be given.

Becker (Hanna). **Ergebnisse und Erfahrungen bei der Resistenzzüchtung gelbrost-widerstandsfähiger Weizen.** [Results and experiences in the breeding of Wheats for resistance to yellow rust.]—*Z. PflZücht.*, xxiv, pp. 539–568, 1942. [Received August, 1946.]

The general tendency for wheat yellow rust (*Puccinia glumarum*) to decrease in incidence with the continuous elimination, over a period of years, of susceptible plants from identical populations cultivated in different parts of Germany, is deflected by (a) irregular and weak attacks in certain years, and (b) the sudden appearance of new races pathogenic to one or both of the partners used in crosses, e.g., race 9 to Ridit, 27 to Chinese, and 2 to selection 1014 [cf. *R.A.M.*, xiii, pp. 567, 757; xix, p. 77; *et passim*].

The incidence of infection in the field may afford a clue to the dominant or recessive mode of inheritance of resistance, transmission through a recessive factor leading to an unmistakable decline in the infection percentages after two years' selection. It is altogether impracticable, in artificial field infection even with the most scrupulous care, to eradicate every single susceptible plant, as may be seen by the results of subsequent greenhouse inoculations on plants remaining ostensibly resistant in the field, among which there is always a small proportion of homozygous-susceptible individuals. In the case of crosses between a seedling-resistant and a field-resistant parent, the infection percentages in the offspring are higher in greenhouse than in field inoculations. Since the field selection of resistant plants from hybrid populations can never be complete, it should merely serve as a preliminary to the greenhouse inoculations. Selection for field resistance can only be practised from among a field-infected hybrid progeny: the subsequent behaviour of the descendants of individual plants in élite plots in the rust garden will show whether the chosen progenitors were really resistant or not.

The cultivation of hybrid populations in systematic sequence in places liable to yellow rust epidemics in France, Germany, Holland, and Sweden gave disappointing results, neither expediting nor enhancing the dependability of the work of selection. On the other hand, it is important that reputedly resistant varieties or selections should be grown in the maximum possible number of different localities and exposed to the locally prevalent physiologic races, the intensive propagation of which may be effected by the simultaneous cultivation of a 'rust-indicator'.

Minz (G.). **Yellow berry and stem rust of Wheat.**—*Phytopathology*, xxxvi, 5, pp. 381–383, 1946.

The flinty kernels characteristic of most indigenous durum and imported durum and vulgare wheats under Palestine conditions frequently bear yellow spots. In field trials on the control of wheat stem [black] rust [*Puccinia graminis*] by sulphur-dusting, treated plants were observed to yield only 0·2 per cent. yellow-spotted kernels as against an average of 24 (range 5 to 63) per cent. for the undusted, infected ones. The analysis (by M. Plaut, unpublished data) of kernels from rusted plants revealed a lower weight, lower protein and gluten contents, and inferior gluten and baking quality as compared with those of the sulphur-dusted. The mid-early Florence variety used in the late trials escapes black rust when sown in good time, but late sowings are very susceptible. Late maturity is one of the factors listed by Heald (Introduction to plant pathology, 1943) as influencing the development of yellow berry in the United States [*R.A.M.*, vi, p. 23] and the fact of its control, jointly with that of black rust, by sulphur-dusting indicates that an etiological connexion exists between the two diseases.

Chester (K. S.) & Preston (D. A.). **Experimental forecast of Wheat leaf rust in Oklahoma for 1946.**—*Plant Dis. Reptr*, xxx, 5, pp. 162–165, 1 graph, 1 map, 1946. [Mimeographed.]

Counts of wheat leaf rust (*Puccinia rubigo-vera* var. *tritici*) [*P. triticina*] pustules in a test field at Stillwater, Oklahoma, at ten-day intervals from 1st February to 1st April, correlated with a survey of the chief wheat regions on 1st April and a study of the weather through the first three months of the year, are used to give a rust forecast sufficiently reliable to help growers to reconsider their crop programmes. In 1946 rust present on 1st April was one-fifteenth of that present in 1945. From this and the weather records it was predicted that it would be an abundant rust year but would probably not reach the epiphytotic proportions of 1945 [*R.A.M.*, xxiv, p. 309].

Sibilia (C.). **Determinazione di alcune razze fisiologiche italiane di 'Puccinia triticina' Erikss. e di 'Puccinia graminis tritici' Erikss. et Henn.** [The determination of some Italian physiologic races of *Puccinia triticina* Erikss. and *Puccinia graminis tritici* Erikss. et Henn.]—*Boll. Staz. Pat. veg. Roma*, N.S., xxii, 3–4, pp. 193–196, 1942. [Received June, 1946.]

The author reports the discovery in Italy of three new physiologic races of *Puccinia triticina*, referred to as B, R1, and R2, and two of *P. graminis tritici*, a new one, I.G.1, and the locally very prevalent race 40.

Borlaug (N. E.), Harrar (J. G.), & Stakman (E. C.). **Flag smut of Wheat in Mexico.**—*Phytopathology*, xxxvi, 6, p. 479, 1946.

Flag smut of wheat (*Urocystis tritici*) was observed for the first time in Mexico on 27th April, 1945, distributed over an area of some 10 sq. miles in the Zitacuaro district, State of Michoacán. Circumstantial evidence points to the introduction of the pathogen on wheat imported from Australia [cf. *R.A.M.*, xxiv, p. 308] for milling but inadvertently used in part for seed. A quarantine has been established to prevent the movement of seed wheat from the invaded region to other parts of the country, and a campaign for seed treatment has also been instituted.

Timonin (M. I.). **Activity of patulin against Ustilago tritici (Pers.) Jen.** –*Sci. Agric.*, xxvi, 8, pp. 358–368, 1946.

In these experiments to determine the feasibility of using patulin [*R.A.M.*, xxiii, p. 117] obtained from *Penicillium* sp. for the control of loose smut of wheat (*Ustilago tritici*), it was found that at a dilution of 1 in 20,000 patulin reduced the growth *in vitro* of *Ascochyta pinodella*, *A. pisi*, *Epidermophyton floccosum*, *Microsporum lanosum*, *Trichophyton crateriforme*, and *T. gypseum*, and completely inhibited that of *U. tritici* at 1 in 100,000.

The fungistatic and fungicidal activity of patulin against the mycelium of *U. tritici* occurred at the dilutions 1 in 400,000 and 1 in 100,000, respectively. The more resistant chlamydospores required dilutions of 1 in 66,000 in direct contact for complete inhibition of germination or 1 in 20,000 for 24 hours. Patulin proved phytocidal to the wheat embryo when seeds were soaked for 24 hours in 1 in 4,000, 1 in 8,000, and 1 in 20,000 dilutions; moreover it failed to reduce the percentage infection of treated plants and was therefore ineffective for seed treatment.

Blodgett (E. C.). **Winter injury of fall seeded Wheat in Idaho.**—*Plant Dis. Reptr*, xxx, 4, pp. 106–111, 1 map, 1946. [Mimeographed.]

In eastern Idaho the general opinion of farmers is that winter injury [cf. *R.A.M.*, xxv, p. 496] to autumn-sown wheat is increasing every year. Samples collected by the author and submitted for diagnosis to W. W. Ray, of Stillwater, Oklahoma, showed that, in addition to snow scald (*Typhula* spp.) [ibid., xix, p. 351], the snow

mould fungus (*Calonectria graminicola*) was consistently isolated. In large fields, where the plants showed a mortality of 90 per cent. in 40- to 50-acre patches, either or both diseases were present and the symptomatological differences between them made diagnosis easy. *Typhula* infection appeared to be limited to areas of exceptionally deep snow, while *C. graminicola* was more generally distributed.

It was noted that winter wheat injury in 1944–5 was almost entirely confined to the north-eastern counties, Fremont and Teton, where about half the acreage surveyed was winter-killed. In these badly infected areas, the ground is covered by snow before it becomes frozen and the soil remains unfrozen throughout the winter, a factor deemed highly important. It is commonly believed that early-sown wheat suffers most injury. A progressive annual increase of infection suggests a build-up of inoculum; some growers report no loss on new unbroken land. Adapted winter wheat is never killed outright by low temperatures: the primary cause of injury is attributable to the parasitic action of the *Typhula* and *C. graminicola*. It was noted that the Palouse area, the Camas Prairie area in Idaho county, and the south-eastern area of the State, according to available data, have suffered little from winter injury, although they have a snow cover similar to that in the affected areas. Losses have been reported from Nez Perce County in recent years.

Observations at the Tetonia Branch Station suggest that crop rotation is a factor in disease incidence. For example, half a field sown with sweet clover [*Melilotus* spp.] and then wheat showed hardly any winter mortality, but there was between 30 and 40 per cent. on the other half with mixed sweet clover and mountain brome [*Bromus marginatus*], followed by wheat. It appeared that crested wheat grass [*Agropyron cristatum*] in a rotation tended to increase winter mortality.

Blodgett (E. C.) & Schultz (H. K.). **Stem distortion of Wheat.**—*J. Amer. Soc. Agron.*, xxxviii, 8, pp. 717–722, 2 figs., 1946.

A peculiar type of stem distortion, transmissible through the seed, has been observed in several winter wheat varieties, including Triplet, Ridit, Hymar, and Turkey, in Idaho and the adjacent areas of Washington. Severely affected culms are dwarfed and remain exceptionally long in the boot stage. Close examination reveals a distorted condition, ranging from a sharp kink to an extremely twisted, looped, or knotted malformation, just below the head, which usually fails to emerge and becomes surrounded by a knot of stem tissue. One, two, or occasionally three culms on a plant may be involved. The disorder is probably attributable to a genetic factor or to a virus, though parasitic intervention is not excluded.

Shands (R. G.). **An apparent linkage of resistance to loose smut and stem rust in Barley.**—*J. Amer. Soc. Agron.*, xxxviii, 8, pp. 690–692, 1946.

The resistance of the Trebi barley variety to loose smut (*Ustilago nuda*) and a similar reaction of Chevron to stem [black] rust [*Puccinia graminis*] and other diseases [*R.A.M.*, xviii, p. 388] are of value in breeding programmes. Trebi is susceptible to *P. graminis* and Chevron to *U. nuda*. Floral inoculations with the latter were made on 98 F_5 plants of a bulk population from the cross of Chevron (C.I.) × Trebi (C.I. 936) selected for resistance to black rust. Over the five-year period from 1941 to 1945, the average incidence of *U. nuda* on Chevron, Trebi, and one of the resistant lines (H 47–26) was 48·6, 2·4, and 1·9 per cent., respectively. In a later test, five heads were inoculated with loose smut in each of 137 F_7 single-plant rows which were homozygous for resistance to black rust. In 136 of the lines there was an average of 67·9 per cent. loose smut, while the only one resistant to *U. nuda* appeared to possess a modified type of resistance to black rust, suggesting a linkage in that particular hybrid between the factors controlling reactions to the two diseases. Loose smut inoculations and exposure to epidemics of black rust over a period of several years showed that the selection H47–26 (Chevron × Trebi) did

indeed inherit a combination of resistance to both diseases. An unnamed variety, C.I. 4979, from Morocco, is resistant to mildew [*Erysiphe graminis*], leaf [brown] rust [*P. triticina*], and the two sporidium-forming smuts [*U. hordei* and *U. nigra*], and susceptible to black rust. In 1944 it also proved susceptible to *U. nuda*, which attacked all 59 plants in the test.

A random population of F_2 plants from H47–26 × C.I. 4979 was florally inoculated in 1944 with a composite collection of loose smut. Segregation for black rust reaction in the F_3 was 23 resistant, 53 heterozygous, and 24 susceptible, the average incidence of loose smut in the three categories being 1·3, 8·3, and 51·4 per cent., respectively. These results indicate a close linkage between the factors for black rust and loose smut reactions in H47–26, the Trebi resistance to *U. nuda* probably being controlled by a single dominant factor similar to that operating in the case of black rust in Chevron [loc. cit.].

Pugsley (A. T.) & Vines (Alison). **Breeding Australian Barleys resistant to covered smut.**—*J. Aust. Inst. agric. Sci.*, xii, 1–2, pp. 44–47, 1946.

Experiments are described, using the inoculation method of Tapke and Bever [*R.A.M.*, xxii, p. 201], to determine the relative resistance of Australian barleys to covered smut (*Ustilago hordei*) and to identify the races of smut in Australia, and also breeding work designed to incorporate resistant genes in Australian varieties by back-crossing. Of 24 barley varieties tested by seed inoculation, Arlington Awnless, Chevron, Duplex, Gopal, Hillsa, Kwan, Lyallpur, Nepal, Nigrate, Peatland, and Peruvian were free from smut in both 1943 and 1944. The commercial Australian varieties were usually susceptible, Californian Feed Nos. 1 and 2 showing most resistance, and the first resisting well a further collection of covered smuts in 1945.

The three Australian smut collections used in these experiments appear to be similar to one another and to resemble most closely, though not completely, Tapke's race 5 [ibid., xvii, p. 308], when the varieties used by him are tested, but when Australian varieties are used differences are evident between the three.

From a study of the F_2 and F_3 generations from the cross Cape (susceptible) × Kwan (resistant), it appears that Kwan contains more than two dominant genes for resistance to covered smut. The material is being carried forward to the F_4 and F_5 generations to confirm this finding. Meanwhile, Kwan is being used as a source of resistant genes for transference to Prior, Research, Maltworthy, and Cape. Several F_5 lines of the cross (Kwan × Prior) × Prior are homozygous for resistance to collection I of *U. hordei*.

Wallin (J. R.). **Seed and seedling infection of Barley, Bromegrass, and Wheat by Xanthomonas translucens var. cerealis.**—*Phytopathology*, xxxvi, 6, pp. 446–457, 1 fig., 1 diag., 2 graphs, 1946.

Seed and seedling infection of barley, brome grass, and wheat was investigated at the Iowa Agricultural Experiment Station in seeds artificially infected by races 1, 4, 5, and 6 of *Xanthomonas translucens* var. *cerealis* [*R.A.M.*, xxv, p. 389]. Hulled barley seed immersed for one hour in a suspension of the pathogen gave rise to 54 per cent. infected seedlings, compared with only 12 per cent. for non-hulled subjected to the same treatment, the latter requiring a 24-hour period of soaking to produce 50 per cent. diseased seedlings.

Seed germination and seedling disease in non-hulled Glabron and Velvet barley were not affected by the temperatures (between 10° and 35° C.) prevailing during seed infestation. The emergence of seeds attacked by race 6 of the parasite was lower than that of the controls at corresponding temperatures except at 35°, where the difference was negligible. The emergence percentage of seeds inoculated with this race was uniform at all temperatures except 30°, where it was appreciably lower (47 per cent. compared with 58 to 63). In the case of race 1, however, emergence

decreased regularly with rising temperatures, from 78 per cent. at 10° to about 12 per cent. at 30° to 35°. Similarly, the percentage of diseased seedlings arising from seed inoculated with race 6 averaged roughly 14 at all temperatures, whereas in the case of race 1 it ranged from a minimum of 6 at 10° to a maximum of 77 at 35°.

Infection of the test plants was facilitated by the rupture of the testa covering the embryo before seed inoculation. Non-hulled barley seeds inoculated with races 1 and 6 and planted in steamed soil produced a proportion of diseased plants, the former race being the more virulent; hulled seed was more vulnerable to both than non-hulled. In a further test with the four races of *X. translucens* var. *cerealis* on wheat and brome grass the latter was susceptible only to race 6, while all were capable of attacking the former. A few seedlings of each host arising from inoculated seeds planted in steamed soil contracted the disease.

Infection of the plumule took place through wounds or stomata on the coleoptile, spread rapidly through the invaded tissues, and eventually reached the enclosed foliage leaves, the first of which was involved before emergence from the coleoptile. With the elongation of the infected leaf the bacteria were carried into the aerial parts of the seedling and induced water-soaked streaks on the primary leaf.

Hansing (E. D.), Heyne (E. G.), & Stanton (T. R.). **Reactions of Oat varieties and selections to four races of loose smut.**—*Phytopathology*, xxxvi, 6, pp. 433–445, 1 fig., 1946.

Greenhouse and field experiments were carried out to determine the reactions of a number of varieties and promising advanced hybrid selections of oats to four races of loose smut (*Ustilago avenae*) recently collected in Kansas [*R.A.M.*, xxiv, p. 446], designated A, B, C, and D, of which the first- and the last-named are distinct from any previously recorded, while B and C resemble Reed's A–1 and A–17, respectively [ibid., xix, p. 466].

In field tests with the 12 'smut-tester' varieties, race A was characterized by the susceptible reactions of Fulghum and Monarch and the resistance of Canadian. Richland and Victoria were susceptible to race D, while Fulghum was resistant.

Of the commercial varieties tested (besides those already mentioned), Boone, Cedar, Tama, Fultex, and Vicland were susceptible in the field to race D, Richland and Columbia were susceptible to races B and C, while Otoe was also susceptible to C. In nursery trials Florilee and Traveler were susceptible to race D. Ventura and Osage were susceptible to D in the greenhouse but intermediate to fairly resistant in the field, while some resistance to this new race was also shown in the field by Benton, Clinton, and Fulton, with 0, 0·1 to 0·5, and 4 per cent. smut, respectively (hulls on), and 3, 5, and 5, respectively, dehulled, and by Mission and Goldwin in the nursery (3 and 1, respectively).

Black Mesdag, Large Hull-less, Red Rustproof, Navarro, Markton, Brunker, Bond, New Nortex, Neosho, Bonda, Mindo, and several hybrid selections were highly resistant to all four races. Neosho is also resistant to the common races of crown and stem [black] rusts [*Puccinia coronata* and *P. graminis avenae*], besides possessing desirable agronomic characters. It therefore appears promising as a parent for oat crosses, and was distributed in Kansas in 1945.

McKinney (H. H.). **Mosaics of winter Oats induced by soil-borne viruses.**—*Phytopathology*, xxxvi, 5, pp. 359–369, 4 figs., 1946.

Two viruses of winter oats have been observed over limited areas in North and South Carolina [cf. *R.A.M.*, xxiv, p. 274], Georgia, and Alabama, one of which is named apical mosaic (*Marmor terrestre* var. *typicum*) and the other eyespot mosaic (*M. terrestre* var. *oculatum*). The former induces on the Letoria and Victoria × Rainbow varieties at 60° to 65° F. pale green to yellow dashes and streaks running parallel with the long axis of the leaf, and sometimes chlorotic mottling, the patterns

being most conspicuous in or near the apical portions of the three upper leaves. At and above 75° the symptoms weaken and the new foliage is free from them. The same varieties react to the latter virus at 60° to 65° by the development of diffuse chlorotic patches and fusiform spots with pale green to ashen-grey borders and green centres, which are most pronounced in nearly or quite full-grown leaves.

Considerable difficulty was experienced in the transmission of the viruses, in contrast to those of brome mosaic (*M. graminis*) and wheat streak mosaic (*M. virgatum*), but with the aid of carborundum diseased juice extracts from mosaic oat plants were successfully inoculated into 972 out of 3,273 Letoria seedlings (29·7 per cent.) after an incubation period of 11 to 70 days. Oat mosaic appears to spread normally through the soil in which overseasoning takes place. Infection from the soil occurred within 35 to 60 days after sowing on plants grown out of doors during the autumn and early winter at Beltsville, Maryland. The mosaic symptoms found expression on the transference of the plants to a greenhouse with a temperature of 65°, but one of 60° appeared to be more conducive to the actual establishment of infection from the soil. *Avena byzantina* is also susceptible to *M. terrestre* and two out of 50 Michigan Amber wheat plants reacted positively to inoculation: maize is apparently immune.

The viruses were more destructive in 1944 than in 1945, though the incidence of infection was about the same in both years; the relatively slight damage in the latter may have been due to the abnormally high early spring temperatures. No evidence of seed transmission of oat mosaic was obtained. Control may be possible through the use of resistant lines and varieties.

Cercós (A. P.) & Favret (E. A.). **'Ustilago maydis', una nueva fuente de radiación mitogenética.** [*Ustilago maydis*, a new source of mitogenetic radiation.]—*Rev. argent. Agron.*, xiii, 2, pp. 128–137, 1 pl., 1 diag., 1946. [English summary.]

Maize smut (*Ustilago maydis*) was shown to be a source of powerful mitogenetic radiation. Strongly positive results were obtained by the exposure to its action, either directly or through quartz, for periods ranging from 10 to 96 hours, of moist photographic plates or films, the effect on dry ones, on the other hand, being barely perceptible.

Experiments with the electroscope showed that the tumours induced by the smut, as well as sporidial cultures, are capable of discharging the apparatus from a distance of 1 cm. and through quartz 0·7 mm. in thickness.

Pathology and mycology of Corn.—*Rep. Ia agric. Exp. Sta., 1944–45*, Part II, pp. 60–64, [? 1946].

I. E. Melhus and G. C. Kent [cf. *R.A.M.*, xxv, p. 339], using their method of inoculating maize plants with *Ustilago zeae* [*U. maydis*: ibid., xxiv, p. 365], found that percentages of smutted plants one week later among varieties from the Corn Belt were 97, among collections from the south-western United States, mostly from Indiana, 95·7, and among 77 Mexican and Guatemalan varieties 88·1, suggesting a higher resistance in these last varieties. Similar inoculations with other grasses showed that teosinte (*Euchlaena mexicana*) was susceptible, while gamagrass (*Tripsacum dactyloides*), Job's tears (*Coix lacryma-jobi*), grain sorghum, and Sudan grass were not infected. A culture of *U. maydis* from teosinte produced smut in maize and its own host.

A further investigation by I. E. Melhus and G. C. Kent of the growth of *Diplodia zeae* in soil, its survival in frozen soil, and manner of overwintering is being carried out. The optimum range of temperature for the growth of the organism in steamed field soil is 25° to 30° C.; minimum and maximum measurable growth in 7 days occur, respectively, at 5° and 40°. No reduction of viability was observed during 30 days' exposure at 10° C.

G. Semeniuk, C. S. Reddy, I. E. Melhus, W. E. Loomis, E. W. Lindstrum, and G. F. Sprague report treatments of U.S. hybrid 13 maize seed [loc. cit.] in co-operative tests with Minnesota, Iowa, Missouri, Wisconsin, Illinois, and Indiana, using spergon, arasan, barbak C, and new improved semesan jr. as dusts at 2, 1, 1½, and 1½ oz. per bush., respectively. Emergence improvement was recorded at six test places in plantings made in late April and through most of May. All the seed showed injury of the coat over the embryo and 30 per cent. carried seed-borne fungi. On the whole, arasan was better than, or as good as, spergon and semesan jr. under cold, wet soil conditions when germination took one or two weeks, while barbak proved slightly superior to spergon and arasan where emergence occurred in under a week. The treatments all gave greater seedling vigour. Marked differences in the materials were noted only in Iowa, where arasan seemed best and semesan jr. the least effective. Mesocotyl necrosis was reduced most by semesan jr. and less by arasan. Spergon and barbak C were generally ineffective except at the planting of 30th May. Semesan alone influenced (slightly) primary root necrosis.

When five-day-old seedlings of these 25 inbred lines, germinated from seed infected with *D. zeae*, were transplanted to the field, high susceptibility to that pathogen was shown by Oh 40B, M14, 38–11, 420, and Y63, while CC28, M8–29, Oh7, R4, 181–2, Y198, 1205, and WF9 were more resistant.

Wernham (C. C.). **Three hitherto unreported diseases of Corn in Pennsylvania.**—*Plant Dis. Reptr*, xxx, 1, pp. 26–28, 1946. [Mimeographed.]

In the course of research with hybrid maize at the Pennsylvania State College three diseases new to the State were reported, viz., *Helminthosporium carbonum* race II [*R.A.M.*, xxiii, p. 293], in Northampton County in September, 1944; *Cochliobolus heterostrophus* (*H. maydis*) [ibid., xxi, p. 71] at Lancaster in September, 1944; and crazy top in a small field of Ohio M 15 at Pennsylvania State College in 1944 with symptoms as described by Koehler [ibid., xix, p. 12]. Only certain lines, viz., I 11 Hy., Mo 940, and Minn C 11, were affected.

In 1945 *C. heterostrophus* caused the most serious leaf blight in south-eastern Pennsylvania and the southern areas of New Jersey. At Avondale, Chester County, Pennsylvania, it assumed epiphytotic proportions.

A notable feature of inoculation tests was the marked resistance to *C. heterostrophus* of inbred lines of Ind 461–3 and Ind Tr, which are highly susceptible to *H. turcicum* [ibid., vi, p. 157].

Pickett (B. S.), Godfrey (G. H.), Altstatt (G. E.), Melhus (I. E.), & Wallin (J. R.). **A disease of Corn in the Rio Grande Valley in Texas.**—*Iowa St. Coll. J. Sci.*, xx, 4, pp. 423–428, 2 figs., 1946.

Twice in 1945 maize plants growing in the Rio Grande Valley were found to be light yellow, streaked, and abnormally stooled, a condition attributed in the first case noted to unfavourable soil influences or lack of water, but found in the second case on experimental plots which were under irrigation. The plants also showed abnormal nodal bud extension, were bushy and often dwarfed, light green, while the leaves were sometimes red or bronze at the tips and edges or streaked with etiolated bands of varying widths; occasionally dwarfing was the only symptom observed. The most characteristic symptom throughout was the pronounced growth of shoots from the axillary buds, from all nodes below the ear shoot node. The lateral branches often grew to be 2 to 3 ft. long, terminated by male and female flowers, of which the latter usually produced some seeds.

The degree of shortening of the internodes depended on the period of development at which infection occurred. Internodes of plants affected early were shortened from the base to the tassel and those later only above the primary ear. Plants infected quite late showed no shortening. While early-infected

plants produced no marketable ears, those attacked later produced some marketable grain.

The disease, which was identified also on dent and popcorn, was most prevalent on the crop planted during January and February, the most important dent varieties, Tuxpan and Mesquitelena, being found infected. Several sweet maize varieties appeared susceptible. Infection in March-planted maize was less and almost negligible in that planted in April. The areas of highest incidence were Weslaco, where all maize types seemed badly damaged, and Santa Rosa, where popcorn suffered most. As no symptoms appeared in plants grown from seed produced by affected plants the disease is probably not seed-borne.

Viennot-Bourgin (G.). **Les pourritures des Agrumes sur le marché français. Caractères biologiques et culturaux.** [Citrus rots on the French market. Biological and cultural characters.]—*Rev. Mycologie*, N.S., vii, 1, *Suppl.*, pp. 4–12, 1 pl., 1942. [Received July, 1946.]

Citrus rots that develop during transit cause serious losses in fruit carried loose in trucks, as is the case on the journey between Spain and France. The development of these diseases necessitates a preliminary inspection [on arrival] at which, sometimes, nearly 6 per cent. of the fruit may be found unfit for human consumption. A second examination when the fruit is sold for retail purposes, including packed as well as loose fruit, necessitates the rejection of a further 1 to 1·3 per cent. After this, the retail purchaser often finds that fruit apparently healthy when bought rapidly rots.

Of these rots the most important are *Penicillium italicum* and *P. digitatum*, the cultural and biological characters of which are fully described. Experiments showed that when dry spores of *P. digitatum* were placed in contact with fruit at 15° C. in a damp atmosphere infection became apparent in 48 hours, as against 60 hours for an aqueous suspension of spores on fruit in a dry atmosphere. Healthy fruits on which the peduncle scar is protected by lanoline or some similar substance resist attack by *P. digitatum* for long periods, but if a superficial scratch is made with a needle, affecting only the skin, infection can occur in four or five days, provided the oil glands have been destroyed; if the scratch involves the flesh, infection follows in 48 to 60 hours. Rots associated with *P. italicum* and *P. digitatum* are often aggravated by bacterial action.

Among other rotting agents on oranges the author found *Verticillium heterocladum* [cf. *R.A.M.*, x, p. 708; xi, p. 641]. The affected fruits developed a soft rot round the calyx, the skin rapidly turning leaden-grey. Inoculations of healthy fruits showed the organism to be parasitic. A *Periconia* sp. was found on flaccid oranges, showing apparently normal flesh but brown spots on the skin. Inoculations of healthy oranges with this fungus gave rise to similar symptoms.

Fungi isolated from deep or superficial skin injuries include *Septoria tibia* and *Macrosporium* sp. on lemons, and *Volutella fusarioides*, *Botrytis vulgaris*, and *Chondromyces* sp. on oranges. The parasitism of these organisms would appear to be secondary or nil.

[Some of the information presented in this paper also appears in *Fruits d'Outre-Mer*, i, 6, pp. 164–171, 6 figs., 1946.]

Frezzi (M. J.) & Mácola (T.). **La podredumbre del pie de los Citrus en la Provincia de Córdoba, Argentina. Importancia, etiología y medios de lucha.** [Citrus foot rot in the Province of Córdoba, Argentina. Importance, etiology, and methods of control.] —*Rev. argent. Agron.*, xii, 3, pp. 203–211, 2 figs., 1 map, 1945.

The available information concerning citrus foot rot or gummosis (*Phytophthora parasitica*, *P. citrophthora*, and *P. palmivora*) and its control in the Province of Córdoba, Argentina, is recapitulated [*R.A.M.*, xx, p. 401; xxiii, p. 294].

KLOTZ (L. J.), CALAVAN (E. C.), & ZENTMYER (G. A.). **The effect of Botrytis rot on Lemons.**—*Calif. Citrogr.*, xxxi, 7, pp. 247, 262, 5 figs., 1946.

The suggestion that the activity of *Botrytis cinerea* has reduced the set of young lemon fruits led to this inquiry by the authors. They found the fungus on bark and twigs damaged by frost, fumigation, oil spray, or shell bark [*Diaporthe citri*]. The importance of moisture for the establishment of infection by *B. cinerea* is emphasized.

Differences in the pathogenicity among strains or races of *B. cinerea* have been noticed. As a result of moist-chamber experiments it was found that blossoms remained unaffected until the time of petal-fall; infection of lemon fruits by contact with diseased petals could not be obtained; using an atomized suspension of the spores on small lemon trees in infection chambers in the orchard, the disease was produced on blooms in various stages of growth. Whether infection began only after the flower stalk started to absciss or whether it induced abscission is not certain, but in some cases the stalks showed penetration and decay before the completion of abscission. The fall of flowers and young fruit on inoculated trees was greater than on the uninoculated controls.

An increased fruit set of 35 per cent. occurred on trees sprayed with Bordeaux mixture. The following fungicides have been found to prevent the germination of *B. cinerea* spores: roccal, isothan, copper 8 hydroxyquinolinate, 604, spergon, zerlate, fermate, copper A, dithane with and without zinc sulphate and lime, zinc oxide, K1957, fungorex, cuprocide, and soda ash. Further spray trials are being conducted to test a variety of such materials.

MCGILLIVRAY (K. D.). **New methods and an old menace. Bulldozers can help to control Armillaria.**—*Agric. Gaz. N.S.W.*, lvii, 7, pp. 362–363, 1946.

The successful use of bulldozers prior to citrus planting for clearing the land of stumps and roots of native trees, a source of infection by *Armillaria* [*mellea*], is reported from the Gosford–Wyong–Mangrove Mountain district of New South Wales.

MARCHIONATTO (J. B.). **Nota relacionada con la etiología de la 'podredumbre de la raicilla' del Naranjo.** [Note relating to the etiology of the Orange 'rootlet rot'.] —*Rev. argent. Agron.*, xiii, 2, pp. 96–100, 1946.

The writer's hypothesis as to the causation of orange rootlet rot in Argentina by the nematode *Tylenchus semipenetrans*, with impoverishment of the soil and incompatibility between rootstock and scion as subsidiary factors, has already been noticed from another source [*R.A.M.*, xxiv, p. 227].

SILBERSCHMIDT (K. M.). **A 'mancha anular', uma nova doença de virus da Arruda (Ruta sp.).** ['Ring spot', a new virus disease of Rue (*Ruta* sp.).]—*Biológico*, xii, 8, pp. 219–220, 1 pl., 1946. [English summary.]

An account is given of a spontaneous ring spot of rue (*Ruta graveolens*) observed by N. R. Nobrega in São Paulo, Brazil. It is characterized by circular, milky-green spots on the new foliage and chlorotic rings with dark-green centres on the middle leaves, which acquire rugose surfaces. The disease was transmitted to healthy scions of *R. chalepensis* by grafting on dying *R. graveolens* stocks, and by the infective sap of the latter species to healthy plants of both. Plans are in hand for an intensive study of the possible connexion between the rue disease and the destructive 'tristeza' root rot of orange [*R.A.M.*, xxv, pp. 161, 302].

SMOYER (K. M.) & HALMA (F. F.). **The rootstock factor in quick decline.**—*Calif. Citrogr.*, xxxi, 7, pp. 249, 282, 1 plate, 1 diag., 1946.

The results of a further survey of orange trees on sweet orange rootstock in the Upper and Lower San Gabriel valleys of California confirm the opinion that the

varieties on this stock are either highly resistant to or immune from quick decline [*R.A.M.*, xxv, p. 498, and above, p. 541]. No decline was observed on any trees on grapefruit, [*Poncirus*] *trifoliata*, or rough lemon stocks. No regular distribution or rate of spread of the disease was detected. In one orchard Eureka lemons on sour stocks showed no trace of decline, suggesting that this variety is immune.

ROHRBAUGH (P. W.). **Mineral nutrient deficiencies in Cal. Citrus trees and their causes. I, II.**—*Calif. Citrogr.*, xxxi, 6, pp. 201, 225–228; 7, pp. 250, 258–260, 1 fig., 1 diag., 1946.

Surveys [*R.A.M.*, xxiv, p. 366] have shown that Californian soils have adequate supplies of the essential elements of nitrogen, phosphorus, potassium, calcium, magnesium, sulphur, iron, boron, zinc, and manganese required by citrus trees. The mineral-deficiency problem, apart from nitrogen, is largely one of unavailability, which is thought possibly to be due in part to high soil pH, with the result that these elements are held in insoluble forms. Remedial measures which may help are cultural practices which will improve drainage and aeration; use of acid fertilizers on light, well-drained soils not having a high boron or sulphur content; allowing alternate middles to dry out as the soil gains in acidity while drying, thus making some of the elements available to the trees; and applying trace elements in sprays.

In part II each element is reviewed in turn under the following headings: its function in the soil and in the plant, deficiency symptoms, excess symptoms, and recommendations for improvements.

JOHNSTON (J. C.). **Trials with zinc-bearing dusts.**—*Calif. Citrogr.*, xxxi, 10, pp. 406–407, 1946.

Experiments with zinc-bearing dusts for the control of zinc deficiency or mottle leaf of citrus trees [*R.A.M.*, xvii, p. 743] were set up in November, 1934, by the Agricultural Extension Service in Tulare County, California; and in tests with zinc sulphate, zinc oxide, metallic zinc, and zinc sulphide the average percentage of mottle leaf observable in February, 1936, representing the average of four trials, was 41·7, 12·2, and 9·7 in respect of applications of 1, 2, and 4 per cent. zinc sulphate in talc, 1 lb. per tree, the untreated control registering 70 per cent. This result was markedly better than in the case of the other dusts used, although for practical purposes zinc oxide and metallic zinc at 4 per cent. gave adequate control. The addition to the dust of blood albumen as a sticker appeared to give no significant improvement.

Spraying of the whole ranch in February, 1935, with lime-sulphur and zinc sulphate resulted in the trees each receiving approximately 0·02 lb. zinc, which compares with the 2 per cent. dust plots. The zinc sulphate plot showed the best result with 8 per cent. mottle leaf and the zinc sulphide plot proved worst with 80 per cent. Excluding the zinc sulphide trial, the average of the 2 per cent. trials was 32·5 per cent., the dusts which equalled the spray in amount of zinc applied showing approximately twice as much mottled foliage as the sprayed trees. This confirms the results of previous trials and field experience.

MILLER (E. V.). **Physiology of Citrus fruits in storage.**—*Bot. Rev.*, xii, 7, pp. 393–423, 1946.

In this critical review of the present state of knowledge concerning the physiology of stored citrus fruits [cf. *R.A.M.*, xviii, p. 673; xxiii, p. 104] the author deals with changes occurring during ripening, after picking, and in cold storage, and with respiration; he then discusses the physiological disorders that develop in cold storage, factors that affect the incidence of low-temperature injuries, the prevention of low-temperature breakdown, carbon dioxide storage, and ethylene treatment. The list of papers cited extends to 75 titles.

Muspratt (J.). **On Coelomomyces fungi causing high mortality of Anopheles gambiae larvae in Rhodesia.**—*Ann. trop. Med. Parasit.*, xl, 1, pp. 10–17, 1 pl., 1946.

Three species of *Coelomomyces*, designated types (*a*), (*b*), and (*c*), have been found as endoparasites of certain anopheline and culicine larvae, almost invariably in proximity to areas of loamy clay, at Livingstone, Northern Rhodesia [*R.A.M.*, xxv, p. 500]. Type (*a*), which appears to be closely related to *C. indiana* Iyengar (*Parasitology*, xxvii, p. 440, 1935), causes considerable destruction of *Anopheles gambiae*; (*b*) possibly akin to Walker's type 4 from Sierra Leone (*Ann. trop. Med. Parasit.*, xxxii, p. 231, 1938), parasitizes *A. gambiae* and *A. squamosus*; while (*c*), showing affinity with *C. stegomyiae* described by Keilin from Malaya [*R.A.M.*, vii, p. 322], has so far been found only on *Aëdes scatophagoides*. Once the fungal growths have reached maturity the larvae are incapable of pupation.

In the laboratory the thin-walled sporangia of types (*a*) and (*c*) germinated in water a few days after the death of the larvae, but the thick-walled ones, representing the resting stage, required two to three weeks' dry incubation at 28° C., followed by re-wetting, before germination took place.

Greaney (F. J.). **Cooperative Flax seed treatment tests in 1945.**—*Plant Dis. Reptr*, xxx, 4, pp. 113–119, 1946.

The results of this uniform flax seed-treatment experiment, presented in a fully tabulated account, show that losses in stands from fractured seeds are only partially remedied by seed treatment and the importance of preventing mechanical injury to flax seed intended for sowing is emphasized thereby [*R.A.M.*, xxiv, p. 507].

In yield experiments at the four Manitoba stations, new improved ceresan, arasan, and spergon produced no increases in yield of high-grade flax seed, but the first applied at 1, 1½, or 2 oz. per bush. to badly fractured seed notably increased the yield. Arasan was less effective, but much more so than spergon. DuBay 1452–F, at ½ and 1 oz., almost equalled new improved ceresan at these dosages. In the 1945 tests in Manitoba, higher yields were obtained from the heavier flax stands from non-fractured seed and from treated fractured seed, than from the lighter stands from untreated fractured seed.

Plant diseases. Notes contributed by the Biological Branch. Diseases of Roses.—*Agric. Gaz. N.S.W.*, lvii, 7, pp. 373–376, 6 figs., 1946.

The following principal diseases affecting roses in the coastal and tableland districts of New South Wales are briefly and simply described: black spot (*Diplocarpon rosae*); powdery mildew (*Sphaerotheca pannosa*); anthracnose (*Sphaceloma rosarum*); rust (*Phragmidium* sp.); stem canker (*Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*]); and crown gall (*Agrobacterium* [*Bacterium*] *tumefaciens*). The measures for their control are specified.

Baker (K. F.) & Locke (W. F.). **Perithecia of powdery mildew on Zinnia seed.**—*Phytopathology*, xxxvi, 5, pp. 379–380, 1946.

In October, 1943, perithecia of *Erysiphe cichoracearum* developed in profusion in the inflorescences of *Zinnia* [*elegans*] in several commercial fields in Ventura and Santa Barbara Counties, California, especially on the Giant Dahlia Flowered Oriole variety. They were most abundant at the stylar end of the ovary and were usually formed at the lower edge of petal infections extending on to the achene. Of 20,861 seeds examined 3·42 per cent. harboured 1 to 9 perithecia and 0·7 per cent. 10 to 100. Of these seeds 9,253 were from a lot commercially threshed and cleaned by machine and they gave percentages of 1·97 and 0·34, respectively. Samples were grown in sterilized soil in the greenhouse for six weeks in the following spring, but no mildew developed on the plants, so that the ascospores, if released at all,

were evidently non-infectious. Repeated applications of sulphur dust in the early part of the growing season are recommended for the control of a disease that may materially reduce the yield and quality of the seed.

Bain (D. C.). **Die-back and stem canker of Camellia.**—*Plant Dis. Reptr*, xxx, 6, pp. 206–208, 1946. [Mimeographed.]

In nurseries along the gulf coast of Florida in February, 1946, die-back and canker were noted on both coloured and white varieties of *Camellia*. Tissue platings from plants showing both infections consistently yielded one or more species of *Gloeosporium*. Some of these isolates were shown experimentally to be able to produce die-back symptoms as observed in nature. It is considered that fungicidal spraying was adopted too late this year, as all the treated plants continued to show die-back and, if the author is correct in believing that infection takes place at or about the bud scale scars shortly after the buds begin to swell, spraying should begin before this and be continued until the shoots have passed the delicate stage of immaturity.

The varieties Magnoliae florae and Alba plena seemed most susceptible to the diseases, but no die-back or canker has been noted on Prof. Sargent and Perfection alba, although these were growing among others severely infected.

Thomas (H. Earl) & Hansen (H. N.). **Camellia flower blight.**—*Phytopathology*, xxxvi, 5, pp. 380–381, 1946.

Subsequent to the writers' determination of *Sclerotinia camelliae*, the agent of a floral blight of *Camellia* [*japonica*] in California, as a new species in 1940 [*R.A.M.*, xix, p. 350], they were informed by Professor I. Hino, Miyazaki College of Agriculture, that what appeared to be the same disease and fungus had been described by K. Hara in a Japanese journal some 20 years earlier. Notwithstanding the rather larger dimensions of the asci (120 to 140 by 6 to 8 μ) and ascospores (8 to 11 by 4 to 5 μ) of the Japanese species as compared with the American (100 to 125 by 4·3 to 5·8 and 5·3 to 7 by 2·5 to 3·5 μ), respectively, the fungus concerned in both countries appears to be essentially the same and should in future be designated *S. camelliae* Hara.

In April, 1943, blighted flowers and single petals bearing sclerotia were placed on soil in separate boxes, covered about 1 in. deep with peat moss, and placed under lath, the moss being kept continuously wet thereafter. On 24th February, 1944, apothecia were found in both boxes, and production continued until mid-April in the case of the whole flowers. Sclerotia of the latter left undisturbed in the box gave rise to apothecia from 6th February until 15th April, 1945, and fructifications reappeared in February, 1946.

Since only the ascospores are infective and open flowers alone are vulnerable, control should be practicable by the systematic destruction of diseased inflorescences, possibly supplemented by ground-spraying with fermate (4 lb. per 100 gals. water), which appears to inhibit apothecial formation.

Garren (K. H.). **A disease of English Ivy in Georgia.**—*Plant Dis. Reptr*, xxx, 6, pp. 209–210, 1946. [Mimeographed.]

Colletotrichum trichellum was isolated from diseased leaf and petiole tissue, but not from stems, of ground plantings of ivy (*Hedera helix*) from Atlanta, Georgia, the necrotic symptoms recalling those described by Weiss [*R.A.M.*, xxii, p. 481]. A species of *Phyllosticta*, however, was the fungus most frequently isolated from leaves and petioles. *P. hedericola* and *C. trichellum* were found as secondary invaders of greenhouse ivy by White and McCulloch [ibid., xiii, p. 773], and the lesions observed by the present author are similar to those reported by them. Stem isolations yielded *Fusarium* spp., *Diplodia* sp., and *Phoma* sp. with about equal frequency. Reinoculation tests are planned.

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Trumble (H. C.) & Ferres (H. M.). **Responses of herbage legumes to applied nutrients on some southern Australian soils and their dependence on external factors.**—*J. Aust. Inst. agric. Sci.*, xii, 1–2, pp. 32–43, 1 fig., 7 graphs, 1946.

In the course of these studies [*R.A.M.*, xxiii, p. 244, and next abstract], zinc, molybdenum, and potash proved to be the most important, of nine mineral elements investigated, for the early growth of subterranean clover. In spite of the presence of copper in trace amounts in the distilled water employed, some responses to additional copper were obtained. The regions in which field responses to zinc and molybdenum may be anticipated are indicated. Light duration and temperature were shown to modify the response to zinc, the effects being on the plant and not on the soil.

Lucerne, [herbage] peas, barrel medick [*Medicago* sp.], subterranean clover, and strawberry clover [*Trifolium fragiferum*] all responded actively to molybdenum, the last three to zinc as well, but only lucerne gave a good response to copper.

Parbery (N. H.). **The effect of molybdenum on Clover growth on laterite soils.**—*Agric. Gaz. N.S.W.*, lvii, 7, pp. 343–347, 4 figs., 1946.

While the use of molybdenum oxide at 4 oz. per acre on moderately deteriorated laterite soil in New South Wales increased somewhat the growth of subterranean clover [*R.A.M.*, xxv, p. 36, and preceding abstract], it had no effect in the presence of lime or dolomite; and while it promoted marked increase of growth on two similar soils, a combination of phosphate and dolomite was much more effective. Whatever improvement molybdenum may make to base-impoverished soils, it is nevertheless important to remedy major basic deficiencies in these soils.

Wahlin (B.). **Sjukdomar och skadedjur på Rödklöver i Östergötland 1945.** [Diseases and pests on Red Clover in east Gothland 1945.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1945*, 6, pp. 88–92, 1 map, 1945.

Red clover in east Gothland, Sweden, where the crop is intensively cultivated for seed, suffered considerable damage in 1945 from rot (*Sclerotinia trifoliorum*) [*R.A.M.*, xxv, p. 103], which reduced the stand by over 25 per cent. in places. *Botrytis anthophila* [ibid., xviii, p. 742] was observed in several localities, its incidence generally averaging from 1 to 2·8 per cent. (maximum 5).

Decker (P.). **The effect of depth of planting on the emergence and survival of Blue Lupine.**—*Phytopathology*, xxxvi, 6, pp. 479–480, 1 fig., 1946.

In an experiment to determine the effect of planting depth on the loss of blue lupin seedlings from *Rhizoctonia* spp. in Florida, where the crop is grown as a winter cover, 200 seeds were planted in the greenhouse in each of 16 flats containing field soil from the surface 3 in. In eight of the flats the planting depth was 1 in. and in the remainder 2 in. Five days later 94·1 per cent. of the seedlings in the 1-in. flats had emerged, whereas the maximum of 54·7 per cent. for the 2-in. planting was not recorded until the tenth day. In the shallow plantings the seedlings were killed by the fungus over small, localized areas, whereas there were only a few scattered survivors in the deeper ones. Three weeks after planting, 70·7 per cent. of the shallow-planted seedlings, which had attained an average height of 8 in., appeared healthy, while only 6·5 per cent. of those in the 2-in. flats were alive.

Weimer (J. L.) & Elrod (J. M.). **Powdery mildew of annual Lespedezas.**—*Plant Dis. Reptr*, xxx, 1, pp. 13–16, 1946. [Mimeographed.]

Although powdery mildew (*Microsphaera diffusa*) is not a serious pathogen of the bush clover (*Lespedeza*) plant, the rather wide distribution of the disease in 1945 on test plots of *L. striata* and *L. stipulacea* at the Agricultural Experiment Station,

Georgia, led the authors to investigate the severity of *M. diffusa* in nursery rows and on plants naturally inoculated in the greenhouse.

Field observations on 19 strains of Kobe *L. striata* and 21 of Korean *L. stipulacea* showed considerable variation in the incidence of the disease, which ranged on the former from 1 to 6 on a rating scale of 1 to 10 (0 representing freedom from, and 10 extreme infection), and on *L. stipulacea* from 0 to 9. Seven selections of Korean were rated at 0 but none of Kobe were free from mildew. The senior author's greenhouse observations in 1943 disclosed similar wide variation in the resistance to and amount of disease under different conditions. Individual plants in some of the 17 strains being grown were quite free from disease, although growing in pots among many badly infected plants. One strain of Korean remained consistently free from mildew.

The general results of these tests are considered to show that while there is a tendency for strains of *L. striata* to be more susceptible than those of *L. stipulacea*, as suggested by Johnson *et al.* [*R.A.M.*, xix, p. 657], there are many exceptions.

Sprague (R.). **Fungi isolated from dormant grasses at Mandan, North Dakota, in January.**—*Plant Dis. Reptr*, xxx, 4, pp. 111–112, 1946. [Mimeographed.]

In the course of isolations of fungi from roots obtained from frozen and snow-covered perennial grasses during sub-zero weather an abundant recovery of *Fusarium* [*scirpi* var.] *acuminatum* [*R.A.M.*, xxiv, p. 222] was made, notably from a creeping strain of *Agropyron michnoi* and from lucerne included for purposes of comparison with the grasses. There was no evidence at Mandan of severe injury to these grasses caused by a species of Basidiomycete such as that reported from Alberta [ibid., xxi, p. 143], at least under the conditions of the closed winter of 1945–6.

Jenkins (Anna E.), Forsell (M. J.), & Boyle (L. W.). **Identity and known distribution of Elsinoe piri in Washington and Oregon.**—*Phytopathology*, xxxvi, 6, pp. 458–461, 1 fig., 1 map, 1946.

Elsinoe piri has been isolated from apple and pear leaves [*R.A.M.*, xix, p. 366; cf. also viii, p. 469] in several localities of Washington and Oregon, this being the first record of the occurrence of the fungus in North America, where the economic importance of the susceptible crops invests the discovery with special interest. On Grimes Golden apple fruits the spots were generally brick-red (Ridgway) paling towards the centre with advancing maturity. On a seedling apple the lesions were particularly vivid, the smaller ones being pomegranate-purple, the larger and more diffuse areas Eugenia-red, and the centres of the older spots purple-brown, contrasting with the lumier- and light lumier-green of the healthy apple skin. A single collection of Washington quince leaves also yielded *E. piri*.

The fungus occurred exclusively in its imperfect state, *Sphaceloma pirinum* (Pegl.) Jenkins n.comb. [*Gloeosporium pirinum* Pegl.]. Conidia were seldom detected on the linear, sometimes branched, dark pustules protruding through epidermal fissures. The spots on pear leaves resemble those on apple foliage, and further agree with Arnaud's description of a pear leaf spot in France, now referred to *E. piri*.

The accompanying map indicates the wide distribution of the pathogen west of the Cascade Mountains.

Tunblad (B.). **Några iakttagelser i samband med besprutningsförsök mot skorv.** [Some observations in connexion with anti-scab spraying experiments.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, *1945*, 6, pp. 87–88, 1945.

Comparative spraying experiments against apple scab [*Venturia inaequalis*] were carried out in the Mälordal district of Sweden in 1945 on the Sävstaholm and

Signe Tillisch varieties as follows: (1) control; (2) Bordeaux mixture throughout, 0·8–2·4–100 before and 0·5–1·5–100 after blooming; (3) Bordeaux before and lime-sulphur (3 per cent.) after; (4) lime-sulphur throughout (4·5 per cent. before and 3 per cent. after). The sprays were applied to both varieties on 3rd May, 12th and 27th June, and 27th July, with a final treatment on Signe Tillisch on 28th August.

The infection percentages on Signe Tillisch in the different categories were (1) 57·6, (2) 9·7, (3) 31·4, and (4) 27·3, and for Sävstaholm 70·3, 24·1, 26·9, and 10·7, respectively, and the average weights (in gm.) of sound fruits in the former variety (1) and (2) 144, (3) 130, (4) 133, and in the latter (1) 64, (2) 106, (3) 93, and (4) 86, respectively.

Björling (K.). **Fortsatta rön angående en nyligen beskreven Äpplesjukdom.** [Further observations on a newly described Apple disease.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1945*, 6, pp. 92–94, 2 figs., 1945.

In the summer of 1945 *Pleospora mali* [? *P. herbarum*] and *Stemphylium congestum* (both regarded as forming part of a disease-complex) were again isolated from 19 out of 31 unripe Bramley's Seedling apples in three localities in south Scania, Sweden [*R.A.M.*, xxiv, p. 454]. The fruits of a single tree in one of the orchards visited bore dark-coloured (mostly black) lesions, while a few showed the pale yellow, waxy spots associated with incipient water core. The dead fruit spurs on the tree yielded *P.* (?) *herbarum* in pure culture. The majority of the affected apples were situated on the south side of the tree, and sun scald is therefore presumed to be the primary cause of the trouble, with the fungi as secondary invaders of the wounded tissues.

Björling (K.) & Nilsson (L.). **Bakteriell hagelskottsjuka pa Plommon.** [Bacterial shot hole disease on Plum.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1945*, 6, pp. 81–84, 4 figs., 1945.

In the middle of July, 1945, specimens of plum leaves and fruits with bacterial shot hole were received at the Åkarp branch of the Swedish Plant Protection Institute. The leaves were studded with holes of varying dimensions and brown to blackish-brown, dry, hard spots, some of which had largely parted from the surrounding healthy tissue and were on the point of dropping out; their edges consisted of a narrow zone of dry, brown or blackish-brown tissue. Some leaves were so severely attacked that practically nothing was left but the midrib and a narrow, ragged strip of the adjoining lamina. The fruits bore numerous necrotic depressions, up to several mm. in diameter, the larger ones partly or wholly filled with a solid gummy exudate. Many of the heavily infected leaves were adhering firmly to the fruits. Besides the Åkarp outbreak the disease was later observed in two nursery-gardens at Alnarp, where the foliage only was affected. Of the three commonly grown varieties, Victoria, Jefferson, and Ontario, the first-named was the only one to suffer extensive damage, involving 50 to 60 per cent. of the fruits.

Of 25 isolates from leaf and fruit spots transferred to meat peptone agar, five were pathogenic to inoculated unripe fruits; one of them was grey-white and originated in the foliage, while the others were yellow and emanated from both leaves and fruit.

In cultural studies two of the four yellow isolates produced on meat extract agar yellow, circular, even colonies agreeing with those of *Phytomonas* [*Xanthomonas*] *pruni*, while the grey to blue growth made by the grey-white strain was characteristic of *Pseudomonas prunicola* [*R.A.M.*, xxv, p. 349]. All the cultures were still viable after 12 days and only the grey-white one had succumbed at the end of 23, in contrast to *Phytomonas* [*Pseudomonas*] *mors-prunorum*, which was shown by Wormald to secrete acid so rapidly and profusely as to die within a week [ibid., xii,

p. 227], whereas *P. prunicola* is much slower in this respect. The grey-white isolate and two of the yellow strains further agreed with *P. prunicola* and differed from *P. mors-prunorum* in the production of acid from lactose. The thermal death points of *P. prunicola* and *X. pruni* are 46° and 51° C., respectively, that of *P. mors-prunorum* being unknown. The grey-white isolate was killed by exposure to 47°, while the yellow ones survived. All the Swedish plum strains were Gram-negative, like *X. pruni* and *P. prunicola* and in contrast to the Gram-positive *P. mors-prunorum*. The grey-white bacteria consist of rods measuring 1·3 to 3·1 by 0·6 to 0·9 μ, sometimes united in chains up to 6 to 7 μ long, corresponding to *P. prunicola*.

It is concluded that the agent of the shot hole disease of plums in Sweden is obviously distinct from *P. mors-prunorum*. The grey-white foliar organism bears a strong resemblance to *P. prunicola*, while a couple of the yellow ones are somewhat akin to *X. pruni*. Further studies are planned to determine the exact relationship between the Swedish and foreign bacterial pathogens of the plum.

Millthorpe (F. L.) & Vincent (A. E.). **Bacterial canker of stone fruit.**—*Agric. Gaz., N.S.W.*, lvii, 5, pp. 255–257, 9 figs., 1946.

Bacterial canker of stone fruits, due to *Pseudomonas cerasi* var. *prunicola* [*P. prunicola*: xvi, p. 328; see also preceding abstract; and *P. mors-prunorum*: ibid., xviii, p. 746] occurs throughout New South Wales, causing serious losses among all stone fruits. A description is given of the leaf and shoot symptoms and of the two types of cankers 'gummosis canker' and 'sour sap canker', a brown, moist condition of the bark, first appearing as a slightly sunken area, and later emitting a sour, fermented odour.

Tentative control measures recommended are as follows. Pruning should be completed as soon as possible after leaf-fall. The trees should be sprayed in early May, mid-June, and late July with Bordeaux mixture (15 15–100) plus ½ gal. white oil per 100 gals. or a good spreader. Varietal resistance has been observed and is being investigated.

De Ong (E. R.). **Injury to Apricot leaves from fluorine deposit.**—*Phytopathology*, xxxvi, 6, pp. 469–471, 1 fig., 1946.

Lucerne and other pasture crops, Tilton apricot, English walnut, and White Adriatic fig trees, lilac, blackberries, roses, *Hydrangea* [*hortensis*], and a single plum tree suffered more or less severe injury in California in 1943 and 1944 from the fluorine [cf. *R.A.M.*, xxii, p. 119] in the fumes emanating from a neighbouring aluminium plant.

The intensity of the symptoms varied with the distance from the plant and culminated in the extensive defoliation of trees in its immediate proximity. For instance, in a 40-acre Tilton apricot orchard, some 60 per cent. of the trees had shed their leaves by 1st August, 1944, while the bulk of the remaining foliage was brown and necrotic, as though scorched by fire. The young twigs exuded copious amounts of gum, pockets of which were also situated at the crown in some five-year-old trees. The 1945 crop yielded only about half the normal quantity of fruit, presumably on account of premature defoliation and bud injury in 1944. The amounts of fluorine determined on leaves taken at random from fig and apricot orchards ranged from 247 to 403 parts per million.

The first foliar symptom on apricots was observed two to three weeks after the trees came into leaf and consisted of a progressively increasing marginal wilt, involving a width of ⅛ to ⅔ in. and causing necrosis of the affected tissues in about ten days. The damage, which was confined to nearly full-grown leaves, persisted without interruption for about two years, when the plant was closed down. The same type of symptoms, declining *pari passu* with distance from the source of the trouble, occurred for eight miles to the windward.

Gigante (R.). **Il giallume del Pesco.** [Peach yellows.]—*Boll. Staz. Pat. veg. Roma*, N.S., xxii, 3–4, pp. 173–180, 3 figs., 1942. [Received June, 1946.]

Peach trees growing at Grottarosea, near Rome, showed symptoms agreeing perfectly with those of peach yellows as reported from the United States [*R.A.M.*, xxiii, p. 28; xxiv, p. 128]. Grafting experiments successfully transmitted the disease and so confirmed the identity of the condition with yellows.

Stout (G. L.) & McClain (R. L.). **Peach wart found in California.**—*Plant Dis. Reptr*, xxx, 6, pp. 202–203, 1946. [Mimeographed.]

A manifestation of peach wart [virus] disease, showing symptoms characteristic of those described by Blodgett [*R.A.M.*, xxii, p. 213] was found for the first time in California in June, 1945, on the Candoka variety at one ranch in San Bernardino County with a large acreage of peach trees of many varieties. The infection is thought to have arisen from scion wood and from 15 Candoka nursery trees imported from Washington in 1941, the former having been used for the top-working of some 285 peach trees. Inspection of other Candoka plantings disclosed only a few trees similarly attacked, all on properties within a few miles of each other. All warted trees have been removed and close watch is being kept for additional suspects.

Mills (W. D.). **Temperature effects on the expression of the yellows virus in sour Cherries.**—*Phytopathology*, xxxvi, 5, pp. 353–358, 1946.

The expression of the cherry yellows virus [*R.A.M.*, xxiv, p. 236] in New York orchards in any given season depends primarily on the prevailing temperature during the month following the petal-fall stage. High temperatures at this time decrease the symptoms of the disease, which appeared in a mild form in the 17 years between 1921 and 1945 when the mean temperatures 1 to 10, 11 to 20, and 21 to 30 days after petal-fall were 62·9°, 65·6°, and 68·6° F., respectively, and in a severe one in the eight years when the corresponding temperatures were 55·4°, 58·9°, and 63·9°, respectively. On the other hand, abnormally high March and April temperatures tend to increase the subsequent development of yellows by expediting bloom and so exposing the trees at a critical period to the generally low temperatures following petal-fall and favouring the external manifestations of the virus. The severity of the symptoms did not appear to be affected by the amount of precipitation.

Since the temperatures prevailing after petal-fall cause a great variation in the apparent amount of yellows present in an orchard from year to year, the spread of virus after the trees are set can neither be proved nor disproved by any of the observations made to date on the external symptoms of the disease in two different seasons.

Johnson (F.). **Physiologic races of yellow rust of Raspberries in western Washington.**—*Phytopathology*, xxxvi, 5, pp. 383–384, 1946.

Experimental evidence is adduced in favour of the hypothesis that two distinct physiologic races of raspberry yellow rust (*Phragmidium rubi-idaei*) [*R.A.M.*, xiii, p. 526] exist in western Washington. Both the Cuthbert and Washington varieties were shown by cross-inoculation tests to be susceptible to the form present on the latter in Whatcom County, while Washington proved to be resistant to that collected from Marlboro and Cuthbert in the Puyallup Valley. For many years the disease has been a limiting factor in the cultivation of red raspberries in the west of the State, but it was only in 1944 that moderate to severe infection was observed on the supposedly immune or highly resistant Washington variety in commercial fields in Whatcom County. Neither in 1944 nor in 1945 did rust occur on the

Lloyd George and Newburgh varieties in proximity to Washington. In the Puyallup Valley Cuthbert and Marlboro were attacked, while Washington bore only an occasional sorus. So far no infection has been found on Tacoma.

Sakimura (K.). **Two species of thrips non-vectors of the spotted wilt virus.**—*J. econ. Ent.*, xxxix, 3, pp. 398–399, 1946.

Experimental evidence is tabulated and analysed to show that two species of thrips, namely, *Frankliniella sulphurea*, a recent immigrant into Hawaii, and *Anaphothrips* (*Chaetanaphothrips*) *orchidii*, well established in the Islands, are incapable, in contradistinction to *Thrips tabaci*, of transmitting the pineapple spotted wilt virus [tomato spotted wilt virus: *R.A.M.*, xix, p. 483] from diseased to healthy plants. The writer previously obtained similarly negative results with *T. nigropilosus* and *Hercinothrips femoralis* (*J. econ. Ent.*, xxxii, p. 383, 1939).

Bock (E.). **Une technique nouvelle de préparation de bouillies de traitements anti-parasitaires.** [A new technique for the preparation of mixtures for anti-parasitic treatments.]—*Progr. agric. vitic.*, cxxv, 18–19, pp. 303–308, 3 figs., 1946.

A description is given of a new apparatus for preparing fungicidal and insecticidal sprays on a large or small scale which was introduced into Alsace during the war. Twenty of these installations have been set up in the vine-growing areas of the department, and all have given complete satisfaction. An essential condition is a supply of water at a minimum pressure of two atmospheres.

Receptacles of 400 and 600 l. capacity are used for preparing 10 per cent. solutions of lime and copper sulphate, respectively. These receptacles are connected with a 'Mix' apparatus [*R.A.M.*, xix, p. 229] so arranged that the mixtures can be made in any ratio or dilution desired. The method effects great economies in time, labour, and expense.

Schnicker (J. L.). **Kemikaliekontrollen i 1945.** [Inspection of chemical substances in 1945.]—*Tidsskr. Planteavl*, l, 3, pp. 526–538, 1946.

Notes are given on the various infringements of the Danish plant-protective and poison laws detected in the course of the official inspection in 1945 of 347 samples. Analyses are furnished of a number of fungicides and insecticides recognized by the Danish Plant Protection Service.

Kearns (H. G. H.). **Hydraulic spraying machinery for fruit crops. The choice of power equipment.**—*Rep. agric. hort. Res. Sta. Bristol, 1945*, pp. 110–132, [? 1946].

In this paper are set out the biological requirements for spraying fruit crops, and information on technique, choice of machine, the types of power equipment, which are classified, and specifications of machines and component parts.

Ciferri (R.). **Manuale di patologia vegetale.** [A manual of plant pathology.]—xxiii + 730 pp., 256 figs., Genova, Società Anonima Editrice Dante Alighieri (Albrighi Segati, e C.), 1941. 188 L. [Received August, 1946.]

In this work, intended primarily for University students, the author has aimed at avoiding generalities and describing definite, typical diseases of recognized theoretical and practical importance, particularly in Italy. The first section (124 pp.) deals among other matters with the history of the subject, the concept of disease, the relation between ecological factors and plant infection, predisposition,

susceptibility, resistance, and immunity, the physio-pathology of parasitism, the natural enemies of parasites, disease prevention and control, and symptomatology. The second part (pp. 125–231) deals with non-parasitic diseases, the third (pp. 232–310) with virus diseases, the fourth (pp. 311–356), with diseases due to bacteria and Actinomycetes, the fifth (pp. 357–363) with those caused by Myxomycetes, the sixth (pp. 364–652) with fungous diseases, and the seventh (pp. 653–687) with parasitic phanerogams. There is an alphabetical index to the names of Italian authors mentioned, and the subject index fills 37 pages of small print. The whole work is fully illustrated with figures and photographs.

Petri (L.). **Alcune questioni di fitopatologia generale. Introduzione al 1° corso di specializzazione in discipline fitopatologiche tenuto alla Facoltà di Agraria della R. Università di Pisa.** [Some questions of general phytopathology. Introduction to the first specialized course in phytopathological studies held in the Faculty of Agriculture of the Royal University of Pisa.]—*Ann. Fac. agr. Pisa*, N.S., iii, 18, pp. 229–261, 7 figs., 1940. [French, German, and English summaries. Received August, 1946.]

This paper consists of the first two lectures of a course for University students on problems in general phytopathology. In the first lecture the author deals generally with plant immunity from and resistance to infective diseases.

In the second lecture the author discusses the predisposition of plants to disease (distinguishing between normal or physiological, and abnormal or pathological predisposition), pathological processes accompanying infection, variation in fungi (physiologic races), and the question of degeneration due to senility.

Moore (W. C.). **New and interesting plant diseases.**—*Trans. Brit. mycol. Soc.*, xxviii, 3–4, pp. 127–133, 2 pl., 1945.

This is a further contribution to the series [cf. *R.A.M.*, xxii, p. 364] recording new plant diseases in Britain. A scale-spotting of Yellow Prince tulip bulbs was encountered in 1934 and again in 1941 from Lincolnshire, where the disease occurs every year in a number of varieties and is sometimes the source of heavy loss. The outer scale of each bulb, though turning brown, was still somewhat fleshy and immature and on removal brown markings were visible on the first fleshy scale below. Many were pale, brown, indefinite, isolated spots a few mm. in diameter, coalescing where numerous to form irregular patterns on the surface of the scale. Some bulbs showed large, slightly sunken, rounded or heart-shaped areas with definite margins on the 'cheek' of the bulbs, some of which stood out in marked contrast to the white portions of the scales. Later these areas developed light and dark brown rings and streaks, the brown markings penetrating into the scale, but rarely, if ever, extending through to the inner surface; however, similar though fewer markings were occasionally evident on the outer surface of the next inner scale. The disease was recognized by E. van Slogteren as one common in Holland, and he regarded it as physiological in origin; it was usually most virulent on the best stocks and heaviest bulbs. It is reported to be particularly prevalent when bulbs are lifted in wet conditions and stored too close in warm, badly ventilated sheds. Inoculations with isolated bacteria and with diseased tissues gave negative results, and the cause of this scale-spotting still remains undetermined.

The specific identity of a *Fusarium* sp. isolated in September, 1941, from green walnuts, which exhibited small, black, sunken areas at the stigmatic end of the green husk, and its causal relation to the disease still remain uncertain. Other walnut fruits showed as a primary symptom a relatively inconspicuous and roughly circular patch about 1 in. in diameter on one side of the husk immediately below the old stigmatic remains. The tissues of this patch were uniformly raised or irregularly raised and paler than the remainder of the husk, frequently yellowish,

and surrounded by a black band, which broadened to form a more or less complete, depressed, transversely cracked ring. Ultimately the green husk showed a blackish sunken patch 1 in. or more across on one side of the fruit, the blackening tissues becoming studded with the orange sporodochia of a species of *Fusarium*. The affected fruits were mostly immature and the inner shell relatively soft. Sooner or later the testa blackened and the flesh was reduced to a soft, yellow-brown mass. The *Fusarium* spores on the surface of the blackened fruits were usually 3- to 4-septate, the former measuring 22 to 33 by 3 to 4 μ and the latter 30 to 39 by 4 to 5 μ. Pure cultures were obtained from the sporodochia and the same fungus was isolated, though not consistently, from the shell.

Spinach leaves attacked by *Heterosporium variabile* were received from Wimborne, Dorset, in May, 1944. They showed small, scattered, sharply defined, rounded, white spots, 1 to 3 mm. across, mostly on the upper half of the leaf, surrounded by a very narrow shrivelled or water-soaked band. On others representing a later stage the spots had mostly coalesced, were crowded towards the tip of the leaf, and had dark olive-green or black spore tufts. In the final stages the leaves were almost covered with small, separate, dark fungus mats 1 to 3 mm. in diameter, at first mainly ephiphyllous and then more or less equally abundant on both sides of the leaf.

A strain of *Botrytis cinerea* was isolated from dead sainfoin [ibid., xxv, p. 166] seeds, the contents of which were mostly reduced to an amorphous mass, and the external parts to a skeletal network of the more resistant tissues, in which a number of black, sausage-shaped, curved or irregular sclerotia, about 3 mm. long, were embedded.

Leaves, red berries, and the calyx of the box thorn (*Lycium halmifolium*) in a Bodmin (Cornwall) garden at the end of the wet August of 1942 were thought to have been attacked by *Phytophthora infestans* [cf. ibid., vi, p. 48], which was extremely prevalent in the district at that time. The leaves were brown and withered at the tips and many showed large, round, brown spots on the lamina, sometimes reaching the margin. Exposure of the leaves for 24 hours in a damp dish produced a copious halo of *P. infestans* growing out from the still green tissue surrounding the brown lesions. The fungus was found on damp fallen leaves and was present also on some of the fruits. Slices of healthy potato tubers inoculated with spores from the *Lycium* leaves and berries developed a luxuriant growth of *P. infestans* in a day or two. Inoculation experiments on healthy *Lycium* leaves with spores from blighted potato leaves produced lesions similar to those on the shrub. This appears to be the first record of an occurrence of *P. infestans* on a *Lycium* sp. in the British Isles.

Celery seedlings 1 in. or more high from Cambridgeshire, presenting symptoms of the type of root rot caused by *Phoma apiicola* [ibid., xv, p. 275], showed on examination by A. Smith no pycnidia of that fungus, but yielded pure cultures of a fungus identical with *Alternaria radicina* [ibid., xv, p. 768], not previously reported on celery in Great Britain.

Examination by A. Smith of leaves of young wheat plants, grown in Hertfordshire, which became yellow and withered following a fall of snow, disclosed a few small, brown or greyish-brown sclerotia recalling the disease caused by *Typhula graminum* [ibid., xvi, p. 802]. In March the wheat in the field was growing vigorously and it was only after careful search that two or three plants could be found bearing sclerotia on the oldest withered leaf sheaths. Apart from some dwarfing the parts seemed healthy. No sporulation occurred in pure cultures isolated from the sclerotia, but little doubt is entertained that the fungus is *T. graminum* [ibid., xv, p. 347; xix, p. 434]. On dextrose agar the fungus produced one or more coralloid masses of sclerotia, honey-coloured or pinkish at first, but soon becoming reddish-brown with a rather glistening appearance.

Wilson (E. E.) & Baker (G. A.). **Some features of the spread of plant diseases by air-borne and insect-borne inoculum.**—*Phytopathology*, xxxvi, 6, pp. 418–432, 5 graphs, 1946.

Numerical data relating to the spread of plant diseases from infection foci to the aerial organs of neighbouring susceptible hosts were compiled from the relevant literature, and the rate at which the incidence of attack diminished with increasing distance from the source of inoculum examined. The diseases fell into three categories in respect of the mode of inoculum dissemination, i.e., caused by (1) fungi spread by means of air-borne spores [*R.A.M.*, xxv, p. 352], (2) bacteria transported by wind-blown rain, and (3) viruses and fungi transmitted through the agency of insect vectors.

The infection gradients developing in proximity to sources of inoculum were compared with the pattern shown by previous investigations to characterize the aerial dissemination of spores. For example, in the authors' observations in California on this aspect of apricot brown rot (*Sclerotinia laxa*), submitted for publication to *J. agric. Res.*, for a minimum distance of 15 ft. from the source, the density, or number of air-borne conidia traversing areas of planes perpendicular to the direction of the wind, diminished in inverse proportion to the square of the distance from the focus of infection, and the rate at which dispersion (the scattering of spores in dimensions perpendicular to the direction of the wind) increased was directly proportional to the distance from the source. Thus, the gradient of aerial spore density was described by the equation $Y = \frac{100}{x^2}$, where Y is the density at x_2 and subsequent distance intervals expressed as a percentage of the density at x_1, or first distance interval. In the case of diseases resulting from air-borne spore infection, the decrease in incidence with increasing distance from the source was described with a fair degree of accuracy by a modified form of this equation, viz., $Y = \frac{100(1+a)^2}{(x+a)^2}$. The investigations of Posey and Ford [*R.A.M.*, iv, p. 199] and Buchanan and Kimmey [ibid., xvii, p. 495] on the spread of white pine blister rust (*Cronartium ribicola*) from currants to pines afford suitable illustrations of the application of this equation.

Faulwetter's data concerning the spread of angular leaf spot of cotton (*Phytomonas* [*Xanthomonas*] *malvacearum*) by wind-blown rain (*J. agric. Res.*, viii, pp. 457–475; x, pp. 639 648, 1917), those of Linn on the transmission of [aster] yellows of endive by leafhoppers [*Macrosteles divisus*: *R.A.M.*, xx, p. 337], of Frampton *et al.* on the dissemination of the potato yellow dwarf virus by the clover leafhopper [*Aceratagallia sanguinolenta*: ibid., xxii, p. 75], and of Zentmyer *et al.* on the transmission of Dutch elm disease [*Ceratostomella ulmi*] by bark beetles (*Scolytus multistriatus*) [ibid., xxiv, p. 211], also present certain analogies with the diseases carried by air-borne spores in respect of the relationship between the amount of infection and distance from the focus.

The equation used by Gregory [ibid., xxiv, p. 378] for the transfer of atmospheric properties by eddy diffusion, and representing the dispersion of air-borne particles downwind from a point source, was examined. When normal values for the constants of this equation were employed, the resulting curve did not differ significantly from that given by the equation referred to above when $a = 0{\cdot}21$, but at low atmospheric turbulence or during brief periods of observation of spore dissemination, the curve of Gregory's equation represents a slower decrease in the incidence of infection with increasing distance than does the curve of the authors' equation. The major difficulty in the application of the eddy diffusion equation to disease-gradient data lies in its failure to account for the combined effects of a large number of variables, and the family of curves produced by the authors'

equation seems more appropriate to the disease conditions encountered in the field.

Brown (A. E.). **The problem of fungal growth.**—*Mod. Plast.*, xxiii, 8, pp. 189–195, 254, 256, 7 figs., 1946.

The protection from fungal decay of plastic materials under tropical conditions presents many difficulties. In this paper the author examines and discusses the experimental evidence on these problems submitted from Service organizations, industrial laboratories, and university projects to a special subcommittee, established in 1944, of the Tropical Deterioration Administrative Committee of the National Defense Research Committee [cf. *R.A.M.*, xxv, p. 466].

The use of starch-sized in place of de-sized duck in laminates enhanced the susceptibility of the plastic, and paper-based laminates were easier to protect than cloth-based. The sizing on the glass cloth was often responsible for the fungal invasion of phenolic-glass laminates.

Preventol [ibid., xxv, p. 131], copper naphthenate, hydrocide 10X special, and milban, incorporated into vinyl chloride-acetate polymer at the rate of 2 per cent., conferred a degree of protection on material plasticized with tricresyl phosphate and methyl acetyl ricinoleate. Judged by soil-burial tests, milban appeared to be the most effective. After 100 days' hanging in a tropical room the treated plastics were less overgrown by fungi than the control sample.

The incorporation of mercurial fungicides, e.g., phenyl mercuric salicylate, at 0·25 to 2 per cent., in thermoplastic has also been tested on a considerable scale. Plasticizers compatible with these compounds are dibutyl tartrate, dimethyl phthalate, santicizer M–17, triacetin, and triphenyl and tricresyl phosphates. This treatment enabled a number of materials to pass the Signal Corps Specification 71–2202A, involving the use of *Aspergillus niger* as a test organism. Protection was conferred by this means on cellulose acetate plasticized with santicizer M–17, ethyl cellulose plasticized with the foregoing or tricresyl phosphate, and cellulose nitrate plasticized with tricresyl phosphate. A phenyl mercurial compound (0·5 to 1 per cent.) likewise induced a fungistatic reaction in polystyrene and contact laminating resins of the styrene copolymer type, while less than 1 per cent. phenyl mercuric salicylate sufficed to inhibit mould growth on vinyl copolymers. Phenolic resins were much more refractory to chemical protection. Resistance was imparted to phenol-formaldehyde, cellulose-filled plastic by the addition of 2 (and in some cases 1) per cent. of a phenyl mercuric fungicide.

Fleming (Sir A.). **Chemotherapy. Yesterday, to-day, and to-morrow.**—39 pp., 2 pl., 5 figs., Cambridge University Press, 1946. 2*s*.

In this Linacre lecture for 1946 the history of chemotherapeutical research is traced briefly and illuminatingly from the work of Pasteur up to the present time, when Fleming's own discovery of penicillin has stimulated a great volume of investigation on antibiotics generally. He makes a powerful plea for the speedy endowment of microbiological research.

Gilliver (K.). **The inhibitory action of antibiotics on plant pathogenic bacteria and fungi.**—*Ann. Bot., Lond.*, N.S., x, 39, pp. 271–282, 1946.

The bactericidal and fungicidal powers of 13 antibiotic substances against 33 important plant pathogens were studied in serial dilution tests, which showed that bacteria on the whole were inhibited by more substances and at higher dilutions than fungi. On certain Gram-positive bacteria the highest titres were recorded for gliotoxin [*R.A.M.*, xxi, p. 216; xxv, p. 75], penicillin [ibid., xx, p. 484; xxiv, p. 140], and tyrothricin [gramicidini: ibid., xxi, p. 248]. Gram-positive and Gram-negative bacteria were inhibited at approximately equal dilutions by penicillic acid [ibid.,

xxi, p. 344], aspergillic acid (*J. Bact.*, xlv, p. 461, 1943), and claviformin [*R.A.M.*, xxiii, pp. 183, 267]. The highest sensitivity in fungi was exhibited by *Phytophthora erythroseptica* and *Pythium ultimum*. Resistance was much higher in sporing than in non-sporing fungi. Aspergillic acid and cheiroline (from *Cheiranthus* spp., unpublished work) inhibited almost all the fungi tested; claviformin inhibited fewer fungi, but at rather higher dilutions. The possibility of using claviformin, gliotoxin, penicillin, gramicidin, cheiroline, and aspergillic acid for controlling certain bacterial and fungal plant diseases was suggested by the results of these experiments.

Rao (R. R.) & Venkataraman (P. R.). **Relations between the source of nitrogen and antibiotic formation by Aspergillus fumigatus, Fresenius.**—*Nature, Lond.*, clviii, 4007, pp. 241–242, 1946.

The authors' cultural experiments show that the Czapek-Dox medium favours the formation of the antibiotic products (fumigatin, spinulosin, helvolic acid, and gliotoxin) of *Aspergillus fumigatus* [*R.A.M.*, xxiii, p. 268; xxv, p. 175], the pH shifting from the acid to the alkaline side; with other inorganic and simple organic sources of nitrogen there was no antibiotic activity, and the reaction became more acid. When the fungus was grown on groundnut cake hydrolysate, activity decreased after the third day, but the addition of 0·5 per cent. sodium chloride or 2 per cent. sodium acetate appeared to exert a stabilizing influence. Wheat bran cultures indicated that *A. fumigatus* seems to utilize preferentially complex sources of nitrogen for the production of antibiotic.

Bose (S. R.). **Antibiotics in a Polyporus (Polystictus sanguineus).**—*Nature, Lond.*, clviii, 4009, pp. 292–296, 1 fig., 1946.

In further experiments polyporin [*R.A.M.*, xxiv, p. 463] was obtained from cultures of *Polystictus sanguineus* grown in various Czapek-Dox media with manganese sulphate added and in some cases with extracts of pea seed, green grass, and autoclaved wheat. *Staphylococcus aureus, Streptococcus pyogenes, S. viridans, B[acillus] typhosus* and *B. paratyphosus* A and B, *B. flexner, B.* [*Bacterium*] *coli*, and *V[ibrio] cholerae* proved susceptible to polyporin. Positive results in the clinical treatment of various local infections are recorded. An account is given of chemical investigations and methods of extraction of the antibiotic.

Dey (N. C.). **On the production of streptomycin. I.**—*Sci. & Cult.*, xii, 2, pp. 100–103, 1946.

Particulars are given of the composition of 11 media, including Waksman's glucose broth [*R.A.M.*, xxiv, p. 426], which proved satisfactory for streptomycin production from *Actinomyces griseus* in the author's tests by the stationary surface culture method (pH 6·8) at the Bose Research Institute, Calcutta.

Feustel (I. C.) & Humfeld (H.). **A new laboratory fermenter for yeast production investigations.**—*J. Bact.*, lii, 8, pp. 229–235, 1 fig., 1946.

An improved laboratory fermenter is described for the culture of yeasts, *Saccharomyces cerevisiae* and *Torulopsis utilis* [*R.A.M.*, xxv, p. 464], employing mechanical agitation for the dispersal of air. Cell concentrations of *T. utilis* of approximately four billion, corresponding to a yeast volume of 3·6 ml. per 15 ml. culture liquid, were obtained in the new fermenter without diminution of the average propagation rate of upwards of 40 per cent. per hour.

Beeson (K. C.). **The effect of mineral supply on the mineral concentration and nutritional quality of plants.**—*Bot. Rev.*, xii, 7, pp. 424–455, 1 diag., 1946.

The author reviews and discusses, with 124 references to published literature, the present state of knowledge concerning the effects of fertilizers, including micro-

nutrients, on the concentration of certain elements in and the nutritional quality of plants.

Snyder (W. C.), Thomas (H. Earl), & Fairchild (S. J.). **A type of internal necrosis of the Potato tuber caused by psyllids.**—*Phytopathology*, xxxvi, 6, pp. 480–481, 1 fig., 1946.

In connexion with a recent study of spindling sprout in White Rose potatoes [*R.A.M.*, xxiii, p. 454] in California, several dozen tubers from plants artificially infested by psyllids were examined for internal symptoms. They had been stored for six months or so at room temperature and had produced either spindling sprouts or none. All revealed characteristic dark flecks, containing amorphous to smooth, spherical bodies of variable size, in the vicinity of the smaller vascular elements, extending throughout the length of the tuber but rather more prominent at the stem end. At a later stage, the discrete, dark, intracellular elements associated with the spotting had disappeared. In other psyllid-induced cases of spindling sprout internal necrosis was not observed [cf. ibid., xxiv, p. 70].

Folsom (D.) & Stevenson (F. J.). **Resistance of Potato seedling varieties to the natural spread of leaf roll.**—*Amer. Potato J.*, xxiii, 7, pp. 247–264, 1946.

In breeding against potato leaf roll, one of the most important diseases of the crop in Maine, European and American varieties, mostly reputed to be resistant, were used as possible sources of resistance, and resistant seedlings from these were used for further crossings. In 1941 and 1944, when leaf roll was severe, many seedlings from B24 (Imperia × Earlaine), two from X247 (Kepplestone Kidney × Earlaine), and one from X1276 (Houma × Katahdin), showed high resistance to the disease.

In 1943 hybrids between resistant seedlings gave better results than those between resistant seedlings and commercial varieties, 40 per cent. of the former developing leaf roll as against 61 per cent. of the latter. In 1944 seedlings introduced from crosses with one Highmoor Farm resistant seedling parent produced 14 times as many seedlings not contracting leaf roll as did those from crosses in which some other European or seedling variety, presumed to supply factors for leaf-roll resistance, was employed.

It is suggested that the wide distribution of leaf roll in 1941 and 1944 may have been promoted by the dispersal of aphid vectors of the disease from infected to healthy plants earlier than usual in the host's development, with the result that the less mature hosts became more acutely infected, but at the same time the authors hold that aphid resistance in seedlings is not necessary for field resistance to leaf roll.

These experiments have shown the possibility of finding potato seedlings resistant to leaf roll in nature and of building-up virus resistance still further by using some of these resistant seedlings as parents [*R.A.M.*, xxii, p. 369]. It is also thought possible to combine field resistance to leaf roll with many characteristics regarded as commercially desirable in America.

Ross (A. F.). **Susceptibility of Green Mountain and Irish Cobbler commercial strains to stem-end browning.**—*Amer. Potato J.*, xxiii, 6, pp. 219–234, 1 fig., 1946.

Güssow (*Amer. Potato J.*, xix, pp. 280–282, 1942) recommended the elimination from seed stocks of all tubers showing symptoms of stem-end browning, thus implying its propagation in the tuber. The present author describes a series of experiments with Green Mountain and Irish Cobbler potatoes, to which varieties the disease is usually restricted in the State of Maine, and it is shown that stem-end browning is clearly related to the source of the seed tubers, and that the differences of susceptibility among lots are reproduced in the tuber and are not caused primarily by environmental conditions.

Little sign of the disorder is found at digging time; consequently the tubers were stored at 50° F. for 90 or more days before being examined for the disease [*R.A.M.*, xxiii, p. 272]. Preliminary experiments showed that, apart from one lot (later found to be mixed), the crop produced from diseased seed developed no more stem-end browning than that grown from healthy tubers. There seemed nothing to be gained by discarding seed tubers showing stem-end browning.

Data collected over five years showed that all lots of Irish Cobbler were equal in susceptibility and were similar to the Keswick strain of Green Mountain, both producing considerably more stem-end browning than other Green Mountain stocks from Maine and other States.

As a result of selection over a three-year period among potatoes from different areas it was shown that resistant lines tended to retain their resistance and susceptible lines their susceptibility. A comparison of these selected lines with the original lots revealed only two levels of susceptibility to stem-browning. Most commercial lots belong to one class or the other but some are mixtures, and only for these would the discarding of seed tubers seem of practical use. A better practice would be to eliminate mixed lots and secure a strain known to be resistant. In general, the susceptible type or strain showed two to seven times as much stem-end browning as the more resistant strains, according to environmental and cultural conditions during growth. Tuber lines selected from either type were no more or less susceptible than the original unselected lot.

Late blight of Potatoes.—*J. Dep. Agric. Vict.*, xliv, 8, pp. 269–271, 2 figs., 1946.

Although usually unimportant in Victoria, potato blight [*Phytophthora infestans*: *R.A.M.*, xvi, p. 118] can in favourable conditions cause upwards of 75 per cent. loss of the crop. Among methods found satisfactory for controlling the disease, special importance attaches to seed selection, as infected seed is the main source of outbreaks. As these are, however, infrequent, spraying is recommended as economic only in areas particularly subject to blight.

Andrén (F.). **Ob-medlen mod Potatisbladmögel.** [The Ob treatment of Potato blight.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, *1945*, 6, pp. 95–96, 1945.

In experiments carried out in 1945 in Sweden 1 per cent. Ob 2300, the best of the Bordeaux substitutes tested, did not equal Bordeaux mixture in the control of potato blight (*Phytophthora infestans*) [see next abstract]. An increase in the concentration to 2 per cent. is recommended.

Åtgärder för bekämpande av bladmögel och brunröta hos Potatis. [Control measures against leaf mould and brown rot of Potatoes.]—*Flygbl. Växtskyddsanst., Stockh.*, 80, 8 pp., 4 figs., 1946.

In this pamphlet, a revised edition of No. 70 in the same series, 1945, originally issued in 1933 [*R.A.M.*, xiii, p. 123], instructions are brought up to date for the control of potato blight [*Phytophthora infestans*] in Sweden. Copper oxide preparations, e.g., Ob 2300 [ibid., xxii, p. 444, and preceding abstract], cuzol, or kopsit are reasonably effective except under conditions tending to epidemic outbreaks of the disease, such as prevailed in 1945, when they cannot compete with Bordeaux. For the destruction of the haulm 1 per cent. sodium chlorate (also toxic to *P. infestans*) is recommended.

Holmberg (C.). **Drivbänksförsök med tidiga kräftimmuna Potatissorter.** [Forcing bench experiments with early wart-immune Potato varieties.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, *1946*, 3, pp. 40–42, 1946.

Experiments were carried out at the Swedish Plant Protection Institute from 1942 to 1946, inclusive, to determine the relative cropping capacities, under

forcing-house conditions, of some early potato varieties immune from wart disease [*Synchytrium endobioticum*: *R.A.M.*, xxv, p. 521].

Conflicting results were obtained with Dunbar Yeoman, the yield of which in three years (1942, 1944, and 1945) from home-grown, virus-infected 'seed' fell considerably below that of the susceptible Early Puritan used for comparative purposes (83·7 : 100), whereas the tubers of outside provenance grown in 1943, 1945, and 1946 outyielded the standard variety by 29 per cent. Irish Cobbler was slightly less productive than Early Puritan (98·8 : 100), its vigorous aerial system precluding full development on the greenhouse bench. Di Vernon and Dukker outyielded Early Puritan by averages of 5 and 3 per cent., respectively. W.40731, a selection from Weibullsholm Plant Breeding Institute, not yet on the market, proved a heavy cropper, excelling Early Puritan in this respect by a three-year average of nearly 24 per cent., but its very displeasing tuber shape is a great drawback. Sv. 42096 (Swedish Seed Association) was fully as productive as Early Puritan in 1946, and its well-shaped tubers are a further advantage. The average numbers of tubers per plant were as follows: Di Vernon and Sv. 42096 11, Dunbar Yeoman 9·5, Dukker 9, Early Puritan, Irish Cobbler, and W.40731, 8.

Jørstad (I.). **Melding om Potetkreften (Synchytrium endobioticum) i Norge for årene 1939–1945.** [Report on Potato wart (*Synchytrium endobioticum*) in Norway for the years 1939 to 1945.] -*Meld. St. Plantevern, Oslo*, 2, 34 pp., 1 map, 1946.

This is a tabulated survey of the 387 new foci of potato wart (*Synchytrium endobioticum*) detected in Norway since the publication of the writer's last report on the disease [*R.A.M.*, xix, p. 427], in which the relevant information available up to and including 1938 was presented. During the eight-year period under review, the maximum number of fresh centres of infection (129) was recorded in 1944, and the minimum (11) in 1941. Since 1935 a number of zones have been partially or wholly released from quarantine, including 69 properties under surveillance for periods of 12 to 30 years.

A few observations were made in 1941 on the persistence of the fungus in a viable condition in the soil [ibid., xxv, p. 79]. In a light soil allowed to revert to grass for the entire 16-year period since the disease was observed there was no trace of infection on the new crop of a susceptible variety. In a deep, heavy mould, in which immune varieties had been grown, with the exception of a few years, since 1925, one tuber was found infected, while in another fairly heavy soil in the same locality, under grass until two years before the trial, there were five diseased tubers.

Lutz (L.). **Sur la dégénérescence gommeuse des tubercules de Pomme de terre.** [On the gummy degeneration of Potato tubers.]—*C.R. Acad. Agric. Fr.*, xxvi, 19, pp. 664–668, 1940. [Received July, 1946.]

During the winter of 1939–40 Esterlingen potatoes stored in a clean cellar showed wrinkling of the skin. When cut, they displayed a brown, shiny appearance. The medullary region showed large cavities, round which the tissue was dry and pale brown. The internal surface of the cavities was covered with a white mycelial mat. Slightly affected tubers showed only brown marbling towards the centre, with a tendency for the section to blacken rapidly. Some tubers, when sectioned, emitted copious insoluble brown gum from the shiny zone. Microscopic examination showed that this region was the seat of a typical gummy degeneration of the cell walls, though the starch grains appeared to be unaffected. From the protoplasm of the affected cells two organisms were isolated, a bacterium with morphological and biological characters resembling those of *Bacillus solaniperda* [? *Erwinia phytophthora*: *R.A.M.*, x, p. 125] particularly in its ability to liquefy gelatine rapidly, and a fungus identified provisionally as *Fusarium caeruleum*.

Inoculations of healthy tubers with each organism separately gave negative results, but when both were used together the original symptoms were again produced. Stored potatoes should be examined at intervals and affected tubers destroyed, the apparently healthy ones then being treated with formalin solution.

WALLACE (T.) & CATLOW (E.). **Manurial experiments on vegetable crops. IX. Effects of farmyard manure and of various fertiliser treatments on three varieties of Potato.**—*Rep. agric. hort. Res. Sta. Bristol, 1945*, pp. 95–102, [? 1946].

In experiments with Majestic, Kerr's Pink, and Red King potatoes, grown on plots used for continuous vegetable cropping, the effects of dung and various fertilizer treatments showed in the growth and foliage characters. It was possible to distinguish, both visually and by chemical tests, the effects due to deficiency of nitrogen, phosphorus, potassium, and magnesium and high contents of chloride. Dung induced low nitrogen status and nitrogen-phosphorus-potassium and phosphorus-potassium treatments resulted in magnesium deficiency. Nitrogen and potassium deficiencies reduced tuber production most seriously and phosphorus deficiency, while delaying growth early in the season, later did not prevent good, healthy haulm development and high tuber yields. Foliage injury caused by chloride treatments did not affect yields which approximated to those from nitrogen-phosphorus-potassium applications where sulphate was substituted for chloride. Comparison of the seven crops grown since 1940 showed that while low nitrogen and phosphorus status materially reduced yields of *Brassica* crops, low potash status was unimportant, though of great importance for carrot, onion, beet, and potato. Cooking quality of tubers was little affected by manurial treatment, although omission of potash resulted in slight blackening, which was also produced by salt (sodium chloride) dressings in the variety Majestic.

NICHOLAS (D. J. D.). **The application of rapid chemical tests in the diagnosis of mineral deficiencies in Potato plants.**—*Rep. agric. hort. Res. Sta. Bristol, 1945*, pp. 60–80, 4 graphs, [?1946].

During 1945 potatoes growing at four centres under various manurial treatments were tested by the tissue-test technique [*R.A.M.*, xxv, p. 9] enabling comparisons to be made of the same crop plant growing on different soil types and under varied fertilizing conditions. The results, fully tabulated, are accordingly set out.

GANGULY (D.). **A note on the occurrence of Cercospora oryzae Miyake on Paddy in Bengal.**—*Sci. & Cult.*, xi, 10, pp. 573–574, 1 fig., 1946.

In July, 1945, Dharial rice plants at the Bengal Agricultural Institute, Tejgaon, Dacca, were found to be suffering from a severe leaf spot, the symptoms of which were in close agreement with those described by Tullis for the disease caused by *Cercospora oryzae* [*R.A.M.*, xvii, p. 201]. In the current season the same variety was also affected at the Perhampore Farm, Bengal, and Naizarasail was attacked at Dacca. The morphological features of the pathogen, of which this is believed to be the first record from India, correspond with Miyake's description, except for the conidial catenulations, not hitherto associated with the species. This characteristic would place *C. oryzae* in Solheim's genus *Ragnhildiana*, rejected by Muller and Chupp on the grounds of its evanescence [ibid., xv, p. 59].

HEWITT (E. J.). **Experiments in mineral nutrition. III. The visual symptoms of mineral deficiencies of crop plants grown in sand culture. Progress Report, 1945.**—*Rep. agric. hort. Res. Sta. Bristol, 1945*, pp. 44–51, [? 1946].

A further survey is made of characteristic visual symptoms of mineral deficiencies in 29 cereal, vegetable, and other crops [*R.A.M.*, xxv, p. 9] grown in controlled, large-scale sand cultures during 1945.

Hewitt (E. J.). **The resolution of the factors in soil acidity. Progress report I. Season 1945.**—*Rep. agric. hort. Res. Sta. Bristol, 1945*, pp. 51–60, 2 figs., [? 1946].

In this study of factors governing soil acidity observations are recorded and descriptions given of deficiency and toxicity symptoms noted during preliminary sand-culture experiments with cauliflower and runner bean (*Phaseolus vulgaris*) [*R.A.M.*, xxv, p. 197].

Negroni (P.) & Negri (T.). **Flora de 'Aspergillus' del suelo de Buenos Aires.** [*Aspergillus* soil flora of Buenos Aires.]—*Physis, B. Aires*, xv, 47, pp. 193–212, 11 figs., 1939. [Received September, 1946.]

Ten out of 25 compound samples of Buenos Aires soils yielded species of *Aspergillus* in pure cultures on soil extract and Czapek's agar, comprising five strains of the *A. niger* group, four of *A. terreus*, two each of *A. sulphureus* and *A. flavus-oryzae*, and one of *A. nidulans*.

Krassilnikov (N. A.). Влияние растительного покрова на микробный состав почвы. [Microflora of soils as influenced by plants.]—микробиология [*Microbiology*], xiii, 5, pp. 187–198, 4 graphs, 1944. [English summary.]

This paper summarizes the results of some years' observations by the author [*R.A.M.*, xv, p. 520] and by Korenyako [*Microbiology*, xi, 3, p. 105, 1942] on the micropopulations of the rhizospheres of crop plants in different field and greenhouse soils and when grown experimentally in nutrient solutions [*R.A.M.*, xxii, p. 78]. In general the number of species in a rhizosphere is limited to two or three (rarely four to six). Non-sporulating bacteria make up 95·5 per cent. of the species found in rhizospheres.

According to their relationships with *Azotobacter* the author classifies plants into three groups, (*a*) encouraging and increasing it, (*b*) depressing or suspending it, (*c*) without effect. Mycolytic bacteria (particularly those attacking *Verticillium dahliae*) [ibid., xxii, p. 267] develop well under lucerne and clover but not at all under cotton and flax. The species attacking *Fusarium* sp. was more abundant under fallow strips than under crops.

The findings emphasize the need for varied and suitable rotations based on a study of rhizosphere populations.

Mathur (R. S.). **Control of Sugar-cane smut in the United Provinces.**—*Indian Sug.*, viii, 12, pp. 439–440, 1945.

The following are the principal measures to be adopted in a campaign against sugar-cane smut [*Ustilago scitaminea*] in the United Provinces, India. The acreage under such highly susceptible varieties as Co. 313 and Co. 312 should be considerably reduced; the moderately susceptible Co. 370, Co. 385, Co. 513, Co. 290, and Co. 214 should be closely watched; and the cultivation of the fairly resistant Co. 356, Co. 419, Co. 421, Co. 395, and P.O.J. 2878 should be encouraged.

The disease is readily transmitted through the setts, and before the commencement of planting their state of health should be verified. A few of the best fields should be reserved immediately after germination to supply seed for the next year's crop. For every ten acres of planting, one acre should be set aside for seed plots, to be maintained under optimum conditions for the raising of a vigorous crop. Regular inspections should be made for diseased plants and any found collected and destroyed. Infection may take place at any stage in the growth of the cane from germination in April until the crop is ready for harvest, and intensive searches for the young smut 'whips' still encased in the membranous sheaths should be made at

frequent intervals from April to June. Gangs of trained boys are provided with cloth bags, with which the whole of the infected clump is enveloped before being eradicated. When the bags are full, they should be boiled at the factory for half an hour, and the contents then taken out and burnt.

The first flux of smut appears on ratoons and on planted crop raised from diseased setts. Every care must be taken to remove the smut 'whips' which would act as sources of secondary infection if left out in the plots. Other channels of secondary infection are the neighbouring fields of commercial crops, and roguing operations should therefore be continued during the period from October to December.

Setts from the nursery plots should be planted in the multiplication plots belonging to registered growers, who should be convinced, in the first place, that systematic anti-disease campaigns are economical, and secondly that any negligence on their part in the rapid destruction of infected material will be as harmful to themselves as to their neighbours. Factory-owners should, if necessary, provide the requisite equipment free or subsidize its purchase.

MARCHIONATTO (J. B.). **Notas micológicas.** [Mycological notes.]—*Physis, B. Aires*, xv, 47, pp. 133–144, 9 pl., 1939. [Received September, 1946.]

Aecidium berberis-ruscifoliae Henn., collected on *Berberis ruscifolia* leaves in Argentina by L. R. Parodi in 1933, is suspected of constituting a phase in the life-history of wheat black rust (*Puccinia graminis*), but inoculations on wheat failed.

Asperisporium caricae was found on papaw [*R.A.M.*, xxi, pp. 184, 324] leaves in the Province of Salta. Spegazzini (*Fungi guaranitici*, No. 385) reported the occurrence on *A. caricae* of a hyperparasite, *Rhinotrichum gossypinum* Speg., which was also isolated by the author from the papaw leaf spots; its characters in pure culture were those of an *Acremonium*.

Cephalothecium [*Trichothecium*] *roseum*, first identified on rotting cotton bolls in 1925, has since been observed fairly frequently on the same host.

Cercospora epicoccoides Cke and Mass. was detected for the first time in 1928 on the foliage of *Eucalyptus globulus* and *E. rostrata*, and has been prevalent since that date in coastal nurseries, producing reddish-purple, later pallid, misshapen spots, 2 to 3 mm. in diameter, on the leaves. *C. cichorii* was found in 1933 forming roughly circular, chestnut-brown lesions, becoming concentrically zonate, on chicory leaves [ibid., xxii, p. 177]. *Salix matsudana* in a nursery planting was attacked in 1935 by *C. salicina*, producing round, wine-coloured spots, 1 to 1·5 mm. in diameter, overrunning the leaf veins.

Cytospora chrysosperma [ibid., xix, p. 623] was found attacking the branches of Lombardy poplar [*Populus nigra* var. *italica*] and indigenous willows [*Salix*] in the Province of Buenos Aires and on islands in the Paraná Delta. L. R. Parodi collected in 1934 on poplar (*P.* sp.) leaves a fungus, *Taphrina aurea* [ibid., xxiii, p. 254], hitherto recorded only once for Argentina by Spegazzini (*Fungi argent.*, No. 716) in 1898.

Colletotrichum phomoides was observed on tomato fruits in 1928.

Cladosporium paeoniae is the agent of pale chestnut-coloured lesions on peony leaves [ibid., xxii, pp. 67, 170], sometimes involving a large part of the surface. *Erysiphe polygoni* was collected in 1935 on *Delphinium ajacis* [ibid., xix, p. 475], this being the first record of the mildew on the host in question in Argentina. *Gloeosporium cyclaminis*, the causal organism of a very destructive disease of *Cyclamen* in Italy [ibid., v, p. 741], was first observed on specimens of the same host from Bella Vista, Argentina, in 1932, inducing a snuff-coloured tinge and tissue shrinkage in the peduncles.

Raspberries and *Rubus ulmifolius* were found to be infected by *Plectodiscella veneta* in its imperfect state (*Gloeosporium venetum*) in 1932, this being the first record of the fungus for Argentina. The perithecial phase was detected by L.

Grodsinsky in 1934. *Mycosphaerella rubi* was observed in its imperfect state (*Septoria rubi*) on raspberry in 1932.

Phleospora multimaculans Heald and Wolf was first detected on black walnut leaves from Córdoba in 1929, the initially minute, chestnut-coloured spots enlarging to cover the entire surface.

Guignardia bidwellii, in its imperfect state (*Phoma uvicola*) only, was determined for the first time in 1933 as the agent of vine black rot. Virginia creeper (*Parthenocissus tricuspidata*) was recognized for the first time in Argentina as a host of *Plasmopara viticola* [ibid., xxiv, p. 5] in 1935.

Sclerotinia opuntiarum Speg. has been observed on wild and cultivated *Opuntia* spp. since 1921, but all attempts to induce the germination of the young sclerotia on the plants have given negative results. *Sclerotium bataticola* [*Macrophomina phaseoli*] was found destroying the medulla of the basal internodes of a maize stem at the Pergamino Experiment Station in 1934. *Spondylocladium atrovirens*, the agent of silver scurf of potato tubers, was determined for the first time in Argentina in 1934. *Zizyphus vulgaris* leaves were infected in 1935 by *Uredo zizyphi*.

Rhoads (A. S.). **A contribution to the fungus flora of Utah and Nevada.**—*Plant Dis. Reptr*, Suppl. 162, pp. 67–99, 1946. [Mimeographed.]

The lists of fungi in this supplement comprise miscellaneous collections made in Utah and Nevada during the latter part of 1944 and the first half of 1945. They include two Phycomycetes, 31 Ascomycetes, 60 Uredinales, four Ustilaginales, 19 Basidiomycetes, and 13 Fungi Imperfecti.

Lindquist (J. C.). **Especies argentinas del género 'Peronospora'.** [Argentine species of the genus *Peronospora*.]—*Physis, B. Aires*, xv, 47, pp. 13–20, 1939. [Received September, 1946.]

This is a critically annotated list of 15 species of *Peronospora* collected, some for the first time, in Argentina, including the widespread and destructive *P. aestivalis* on lucerne [*R.A.M.*, xxii, p. 112], *P. arborescens* on opium poppy (*Papaver somniferum*) [ibid., xxv, p. 416], *Peronospora brassicae* on cabbage, radish, and swede, *P. gei* on *Geum chiloense*, *P. matthiolae* on *Matthiola incana*, *P. schleideni* [*P. destructor*] on onion, *P. spinaciae* on spinach, and *P. viciae-sativae* on vetch [ibid., xxii, p. 112].

Neergaard (P.). **Danish species of Alternaria and Stemphylium.**—560 pp., 70 figs., 67 diags., 20 graphs, Copenhagen, E. Munksgaard; London, Oxford University Press, 1945. [Danish and Esperanto summaries.]

The writer's exhaustive study of *Alternaria* and *Stemphylium* is described as a continuation of the attempts already made by J. A. Elliott (*Amer. J. Bot.*, iv, pp. 439–476, 1917), P. C. Bolle [*R.A.M.*, iv, p. 60], P. A. Young [ibid., vi, p. 111], and S. P. Wiltshire [ibid., xviii, p. 141] to provide a rational survey of the taxonomy and parasitism of these genera, and represents a further contribution to a monograph on the subject.

In order to determine the host range of individual species of the genera, monospore inoculation experiments were carried out on 36 plant species belonging to 14 families, the ten principal ones being wheat, onion, carnation, cabbage, peas, cucumber, *Godetia hybrida*, carrot, tomato, and lettuce: van Luyk's method, involving the use of seedlings raised from sterilized seeds on filter paper and distilled water in autoclaved test tubes [ibid., xviii, p. 47], was employed in a large number of the trials. *A. tenuis* auct. sensu strictu (the name retained as the designation of a group of forms usually described by this name in the mycological literature), syn. *Macrosporium caudatum* Cke & Ell. p.p., *M. seguerii* Allesch., *A. rugosa* McAlpine, *A. mali* Roberts, and *A. solani* (E. & M.) Jones & Grout *f. symphoricarpi* Davis [ibid., x, p. 669], is ubiquitous and its presence as a facultative parasite on

some 120 species of seeds was established. *A. circinans* (Berk & Curt.) Bolle (which in an addition to this work the author admits is antedated by *A. oleracea* Milbrath) is extremely prevalent on cabbage in Denmark [ibid., xxv, p. 378], where barely 10 per cent. of 746 lots of seed grown from 1935 to 1941 were found to be free of infection. The pathogen appreciably reduces seed production both qualitatively and quantitatively [ibid., xiii, p. 204]. Positive results were obtained in inoculation tests on onion, carrot, carnation, peas, and wheat.

A. resedae n. sp., first observed on *Reseda odorata* seeds in October, 1941 [ibid., xxiii, p. 427], was found to be present between that date and December, 1944, on eight out of 39 lots examined, the incidence of infection ranging from 1 to 28 per cent. Four of the contaminated lots were grown in Denmark, one in Czechoslovakia, one was imported from France, and two from Germany. It is characterized by olive-buff to dark olive-buff, closely septate, non- or sympodially-branching conidiophores, 30 to 50 by 4 to 6 μ; smooth, obclavate, conical, oval, or cylindrical, sometimes slightly curved, deep or dark olive-buff to buffy-brown conidia, produced in chains of up to 10 (usually 5 to 6 in agar cultures), furnished with 1 to 10 transverse and up to 3 longitudinal walls, and a beak measuring 2 to 28 by 2 to 4·5 (2 to 6 by 2 to 4·5) μ, almost invariably non-septate, rarely provided with up to 3 septa, the total length of the conidia, including the beak, being 9 to 66 μ and their width 6 to 15 μ. There is a considerable resemblance between the conidia of *A. resedae* and those of *A. circinans*, but they may be distinguished, e.g., by the greater symmetry, rather smaller cell dimensions, general absence of a beak, fewness of longitudinal septa, and darker coloration of the latter. The optimum temperature for mycelial growth in both species is 25° C. *A. resedae* retains its virulence in culture for a year, after which there is a steady decline, a 2½-year-old isolate having been found virtually non-pathogenic. Cabbage and *G. hybrida* contracted mild infection in inoculation tests with *A. resedae*.

G. hybrida was the only one of the ten main test plants to be attacked by *A. tenuissima* [ibid., xiii, p. 326], which is presumably a saprophyte or at most a facultative parasite of a very low order of virulence. However, a new variety of the species, var. *godetiae*, caused severe depredations in *G. hybrida* crops in Denmark from 1937 to 1941, reducing the seed yield of susceptible varieties like Kelvedon Glory and Sybil Sherwood to a fraction of the normal. It differs from the type in the larger and more frequent terminal swelling of the beak, the length of which may reach twice that of the conidial body instead of the same length, and in its cultural characters, as well as in its severe pathogenicity to *G. hybrida*.

A. dianthi [ibid., xxiii, p. 389] is of rare occurrence in Denmark, where it has been found on *Saponaria officinalis*, *S. vaccaria*, carnation, and *Dianthus barbatus* (seeds only of the two last-named). In inoculation experiments it also attacked *Gypsophila elegans*. On the other hand, *A. dianthicola* n. sp. [ibid., xxiii, p. 427] is common and severe on carnation, *D. barbatus*, and *D. plumarius*, causing the development of whitish- to faintly brownish-yellow, dark-bordered, usually oval spots, 5 to 10 mm. in length, sometimes confluent, forming areas several cm. in length on the stems, leaves, and buds, and producing immediately on the exposure of the petals dense olive-green patches of conidia, which render the flowers unsaleable and may reduce the profits on the crop by 5 to 20 per cent. From 1st April, 1941, to 1st December, 1944, it was isolated from 74 out of 192 lots of carnation and 3 out of 23 *D. barbatus* seed, originating in France, Holland, Germany, and Hungary. The writer thinks there has been widespread confusion in the past between *A. dianthi* and *A. dianthicola*, which may, however, be differentiated on the basis of the following characters. In the former the conidia are broader and shorter than in the latter (13·5 to 66 by 7·5 to 25·5 compared with 12 to 87 by 7·5 to 21 μ), the beak is much shorter (1·5 to 69 as against 9 to 99 μ), there are many more longitudinal septa (up to nine) in *A. dianthi* than in *A. dianthicola* (maximum of three), the conidia of the

former are darker coloured, the cultural features of the two species are quite distinct, and they also differ physiologically, the capacity of *A. dianthicola* for sporulation in culture persisting much longer than that of *A. dianthi*. *G. elegans* was infected by *A. dianthicola* in inoculation tests.

A. matthiolae n. sp. (antedated by *A. raphani* Groves & Skolko as noted in the 'addition' to this work, syn. *A. brassicae* (Berk.) Sacc. var. *macrospora* Sacc.) [ibid., xvi, p. 103] is extremely common on *Matthiola incana* and radish seeds of Danish, Dutch, German, and Hungarian origin (one lot of the former also imported from France). The fungus does not appear to be of great economic importance, though it probably impairs the germinative capacity of the seed, judging by the results of experiments on radish. Positive results were obtained in inoculation tests on cabbage, wallflower, *Iberis*, and lettuce. The principal morphological differences between *A. raphani* and the nearly related *A. brassicae* are the longer conidia and beak of the latter (33 to 147 and 9 to 148 μ compared with 12 to 78 and 3 to 76·5 μ); the rare formation of secondary conidia by *A. brassicae*, contrasted with the normal development of chains of two to four in *A. raphani*; the paler colour of the conidia of *A. brassicae* (deep to dark olive-buff compared with dark olive-buff to buffy-brown in *A. raphani*); and the absence in the former species of gemma formation, a characteristic feature of the latter. A close morphological similarity further exists between *A. raphani* and *A. dianthi*, important differences being the generally smaller and darker-coloured spores of the latter and their conical shape (those of the former are usually oval), and the absence of gemma formation in *A. dianthi*.

A. porri appears to have been only twice recorded in Denmark, in 1937 on onion seeds [ibid., xvii, p. 654] and in 1942 on leek foliage affected by a purple blotch resulting in a loss of 25 to 30 per cent. of the crop. These are believed to be the first observations of the fungus in Europe. Besides *Macrosporium porri*, the author regards *A. allii* Nolla [ibid., vi, p. 524] as a synonym of *A. porri*.

A. porri (Ell.) Saw. [see correction on p. 560] f. sp. *dauci* (Kühn.) n. comb., or in view of Groves and Skolko's paper *A. dauci* (Kühn) Groves and Skolko f. sp. *porri* (Ell.) n. comb. (*M.* [*A.*] *carotae*), is the agent of a destructive leaf spot of carrots in the United States [ibid., xxiv, p. 303], but in Europe it appears to be of little practical importance. Inoculation tests gave positive results on parsley, lettuce, celery, cabbage, cucumber, carnation, *Godetia hybrida*, tomato, radish, and egg-plant. The fungus lost its virulence almost entirely in the course of three years' pure culture.

A. porri (Ell.) Neerg. f. sp. *solani* (E. & M.) n. comb. or *A. dauci* (Kühn) Groves & Skolko f. sp. *solani* (E. &.M.) n. comb. (syn. *A. solani* (E. & M.) Jones & Grout, *Sporodesmium solani-varians* Vaña, etc.), does not ordinarily cause heavy reductions in the Danish potato yield owing to the relatively late development of infection [ibid., xxiv, p. 469], and for the same reason it is of no great importance on tomatoes. Inoculations were successful on chilli, *Capsicum globatum*, tomato, eggplant, carrot, cabbage, carnation, onion, cucumber, lettuce, *G. hybrida*, *Ageratum houstoniarum*, *Nicotiana sanderae*, *Papaver paeoniflorum*, and *Zinnia elegans*. In pure culture the virulence of the fungus declined from the second to the fifth year.

Alternaria zinniae Pape [ibid., xxii, p. 389] has been observed annually on *Z. elegans* in Denmark since 1937, its intensity varying considerably with climatic factors. Other natural hosts include *Callistephus chinensis*, *Chrysanthemum coronatum*, *Cosmos bipinnatus*, *Helianthus debilis*, and *P. alpinum*, while among those artificially infected were lettuce, *G. hybrida*, tomato, and *N. sanderae*.

A. anagallidis, described by Raabe from the vicinity of Tübingen, Germany [ibid., xviii, p. 140], was found by the writer on *Anagallis arvensis* and its var. *coerulea* in the Copenhagen Botanical Garden in 1942. The conidia of the fungus are very similar to those of *A. porri*, but the spore body of *A. anagallidis* is considerably shorter (13·5 to 81 μ).

A. anagallidis var. *linariae* n. var., was found attacking *Linaria maroccana* and *Antirrhinum majus* seeds in the germinator and was weakly pathogenic in inoculation tests on cabbage, *G. hybrida*, lettuce, tomato, *N. sanderae*, and *P. paeoniflorum*. It differs from the type in its conidial dimensions (37·5 to 289·5, inclusive of beak, by 9 to 21 μ). One of the five isolates was still virulent after three years' culture.

Alternaria linicola n. sp. (antedated by *A. linicola* Groves & Skolko) was first detected in 1940 on non-germinating seeds of *Linum grandiflorum rubrum* imported from France, and subsequently reported by Miss Johansen under the designation of *A.* (?) *solani* [ibid., xxiv, p. 451]. It is distinguishable from *A. anagallidis* by its longer conidia (39 to 292·5 μ, inclusive of beak), from *A. porri* by its smaller conidial dimensions, and from *A. lini* Dey [ibid., xiii, p. 239] by its single conidia, those of the Indian species being concatenate.

The percentage of infection in seven lots of cineraria seeds by *A. senecionis* n. sp. ranged from 1·3 to 29·5 per cent. Two of the lots were imported from France and Germany, respectively, while the others were home-grown. *A. senecionis* differs from *A. raphani* in its conidial dimensions (40·5 to 187·5, inclusive of beak, by 10·5 to 48 μ) and absence of a tendency to gemma formation, and from another closely similar species, *A. brassicae*, in the greater width of its conidia and shorter beak (10·5 to 85·5 μ). Inoculation experiments gave positive results on lettuce, cucumber, *G. hybrida*, and tomato, only the first-named, however, reacting to any extent.

A. gypsophilae n. sp. was first detected in 1938 on *Gypsophila elegans* seeds and seedlings suffering from damping-off in the germinator, since when it was repeatedly isolated from seeds of the same species and from three lots of *G. paniculata*, two imported from Holland and one from France. In 1944 it was found in 19 lots of *G. elegans* seed, including one imported from Germany. Differences between *A. gypsophilae* and the allied *A. dianthi* include the modes of conidial production—single in the former and concatenate in the latter—and the narrower conidia with longer beaks of *A. dianthi*. In *A. gypsophilae* the buffy-, olive-, or natal-brown conidia measure 22·5 to 118·5 (inclusive of beak) by 9 to 27 μ. The virulence of two isolates persisted in culture for four years. Carnations were artificially infected by *A. gypsophilae*. *M. nobile* Vize apud Cooke sensu E. Rostrup (1902) is probably identical with this species. *A. cheiranthi* (Fr.) Bolle sensu Wiltshire [ibid., xiii, p. 326] was isolated from 45 samples of wallflower seed between 1st April, 1936, and 1st January, 1944, of which 26 were grown in Denmark, 12 imported from Holland, five from Germany, and one each from England and France. *A. gypsophilae* resembles this species, but the conidia of the latter tend to be considerably wider and more irregular in form. *A. cheiranthi* was successfully inoculated into white cabbage, *I. amara*, radish, and *M. incana*. It was still sporulating after 2½ years in pure culture.

Stemphylium ilicis Tengwall [ibid., iv, p. 60] (*M. abietis* Tengw., *S. congestum* Newton [ibid., vii, p. 789], *S. dendriticum* de Souza da Camara [ibid., ix, p. 687]) is a common saprophyte or facultative parasite which was found by the author in Denmark on 45 species of seeds: it is also prevalent in the same country as the agent of a cucumber leaf spot, in which form it is known as *Sporodesmium pluriseptatum* (Karst. & Har.) Peck (*S. mucosum* Sacc. var. *pluriseptatum* Karst. & Har.) [ibid., xvi, p. 652], a name it is considered advisable to retain pending further clarification of the taxonomic problems involved in its designation. The fungus showed no perceptible impairment of its sporulating capacity after 20 years' pure culture. Cabbage, *Godetia hybrida*, lettuce, and tomato were among the plants attacked in inoculation tests.

M. daucinum Yatel (*J. Microbiol., Ukraine*, v, 2, pp. 195–214, 1938) is stated to be identical with *Stemphylium radicinum*, and *M. arnicae* Rostrup 1905 with *S. botryosum*.

The distribution, economic importance, physiology, pathogenicity, duration of virulence, and control of the various species of *Alternaria* and *Stemphylium* are also discussed.

Oster (G.) & Stanley (W. M.). **An electron microscope study of the contents of hair cells from leaves diseased with Tobacco mosaic virus.**—*Brit. J. exp. Path.*, xxvii, 4, pp. 261–265, 1 fig., 1 graph, 1946.

Electron micrographs, prepared by the gold shadow-casting technique, of the contents of hair cells from the leaves of Turkish tobacco plants infected by the tobacco-mosaic virus [*R.A.M.*, xxv, p. 437] revealed rod-like particles, of which 68 per cent. measured about 280 mμ by 15 mμ. Similar micrographs of normal tobacco leaf hair cells showed no such structures. It seems reasonable to conclude, therefore, that these rods, which have been found to represent the minimal infective units of the virus, occur within the cells of mosaic-diseased tobacco plants. These data do not support Bawden and Pirie's suggestion [ibid., xxv, p. 188] that the primary virus particle is small and not appreciably elongated.

Clayton (E. C.). **Blue mould control in Tobacco beds.**—*Publ. U.S. Dep. Agric.* AIS 37, 7 pp., 3 figs., 1945.

Detailed directions are given of gas [*R.A.M.*, xxiii, p. 505], spray, and dust treatments for the control of blue mould of tobacco [*Peronospora tabacina*]. Paradichlorobenzene is still recommended for the first. Fermate (1½ lb. in 50 gals.) and bismuth subsalicylate (12 oz. in 50 gals.) [ibid., xxii, p. 410] sprays, each with 8 oz. vatsol O.T.C. or 4 oz. vatsol K as wetting agents, are more commonly used at present than the yellow cuprocide (8 oz. in 50 gals.) preparation plus 8 to 12 oz. vatsol O.T.C. or 4 to 6 oz. vatsol K and 2 qts. cottonseed oil [loc. cit.], first suggested for the control of blue mould. For the dust treatment, 7½ lb. fermate plus 42½ lb. pyrax (pyrophyllite) as filler is prescribed. The bismuth spray is said to have more lasting effects than fermate.

Kightlinger (C. V.). **Black root-rot resistant strains of Havana seed Tobacco for the Connecticut Valley.**—*Bull. Mass. agric. Exp. Sta.* 432, 20 pp., 4 figs., 2 diags., 1946.

The various strains of Havana seed tobacco have characteristics sufficiently similar to distinguish this type of seed from others and at the same time are easily susceptible of differentiation as between one another. Susceptibility to black root rot (*Thielaviopsis basicola*) [*R.A.M.*, xxv, p. 189] varies in the majority from moderate to severe, relatively few show high resistance, and none is immune.

The author's observations since 1930 show *T. basicola* as one of the most virulent diseases of Havana seed tobacco in the Connecticut Valley. Its development is mainly determined by the degree of infestation of the soil by the organism, soil reaction, moisture, and temperature, and the relative susceptibility of tobacco to the pathogen. A relatively low soil acidity value favours, and relatively high acidity discourages, the development of black root rot. At pH 6 and above the disease usually causes more or less damage to tobacco in the Connecticut Valley; it is rarely serious below pH 5·6, and is unlikely to develop at 5·2 or lower. The organism grows at soil temperatures between 10° and 40° C., is able to infect tobacco between 15° and 32°, and severe attack occurs between 18° and 23°. High soil moisture near saturation point favours pathogenicity; below saturation point little effect on the development of the disease is observed; but the more the soil temperature is lowered through evaporation of moisture, the more dangerous *T. basicola* becomes.

In breeding for the production of new resistant strains, both parents were selected from Havana seed stock, respectively highly resistant and highly acceptable

in type and quality. Two of the new strains produced, Havana 211 and a later strain, K2, appeared to be worth continuation. The former was bred in Wisconsin from a cross of the resistant, but coarse, Page's Comstock and Havana 38, an improved strain of regular Havana seed. Havana K2 was bred and developed in Massachusetts from a strain of regular Havana seed known as Sandman and Havana 211. Both strains gave better results than regular Havana seed, both in conditions favouring the disease and in conditions favouring tobacco production. Havana 211 has proved able to produce tobacco of good type and quality in large enough amounts to be profitable in the Connecticut Valley. Havana K2 may not be so successful.

Richards (M. C.) & Barratt (R. W.). **A partial survey of the genus Lycopersicon for resistance to Phytophthora infestans.**—*Plant Dis. Reptr*, xxx, 1, pp. 16–20, 1946. [Mimeographed.]

Plants of 70 strains of the edible tomato, 18 of *Lycopersicon pimpinellifolium*, 7 of *L. hirsutum* and one of *L. hirsutum* var. *glabratum*, two, respectively, of *L. esculentum* var. *pyriforme* and *L. esculentum* var. *cerasiforme*, one each of *L. peruvianum* and its var. *humifusum*, and *L. chilense*; the following hybrids, PI 114,969 *L. esculentum* × *L. pimpinellifolium*, Early Chatham × *L. hirsutum* (PI 127,826) F_1, F_2 selections of *L. peruvianum* (PI 129,946) × Michigan State, (*L. hirsutum* × Victor) × Early Chatham, (*L. hirsutum* × Victor) × Victor, and Early Chatham × Pennheart, and John Baer × Victor F_4 selections; and 28 commercial varieties were tested for reaction to *Phytophthora infestans*. The results are tabulated. Under optimum conditions for inoculation and infection all the 137 species and selections proved highly susceptible. Conidial production was not common on the leaves, even when plants were severely attacked and under favourable conditions, as shown by the prolific sporulation on the potato plants used as controls. Leaves of *L. chilense* showed abundant conidial production, and some commercial varieties also.

While varietal resistance to P. *infestans* may be shown within the genus *Lycopersicon*, notably in the field, where conditions may not always favour infection, none of the plants tested exhibited high resistance to, or immunity from, the late-blight pathogen.

Kreutzer (W. A.) & Bryant (L. R.). **Certain aspects of the epiphytology and control of Tomato fruit rot caused by Phytophthora capsici Leonian.**—*Phytopathology*, xxxvi, 5, pp. 329–339, 1 fig., 1946.

In further studies at the Colorado Agricultural Experimental Station on tomato fruit rot (*Phytophthora capsici*) [*R.A.M.*, xxiv, p. 124], which again caused losses estimated at 10 to 25 per cent. of the crop in the Arkansas River Valley in 1945, sporangia developed in profusion within 48 hours at 25° C. on 20- to 60-day-old giant barley cultures ground and mixed with well-moistened, non-steamed field soil. Sporangia were not produced at or below 18° or at 35°, but within the range from 20° to 30° they were formed in abundance, with an optimum at 25°. A soil temperature between 65° and 85° F. is the prerequisite condition for the development of a fruit-rot epidemic, though plentiful moisture is also an essential factor.

The addition of water to soil inoculum held at 25° C. for 48 hours resulted in zoospore production reaching a climax in two to three hours at the same temperature. The earliest infection of unwounded green tomatoes occurred after one hour's exposure to drops of inoculum containing zoospores at 25° and 30°, and a peak was reached after three hours at these temperatures. At 10° a period of five hours was required to induce infection.

Of 120 varieties, lines, and types of tomato tested in the field, only a few (including the Porter variety) showed any promise of resistance.

The information presented in this paper on the control of the fruit rot has already been noticed from another source [ibid., xxiv, p. 477].

Baker (K. F.). **An epiphytotic of Rhizopus soft rot of green-wrap Tomatoes in California.**—*Plant Dis. Reptr*, xxx, 1, pp. 20–26, 1946. [Mimeographed.]

Old and badly infested picking-boxes in which fruit had previously been allowed to decay [*R.A.M.*, iii, p. 143; xii, p. 121; xxiv, p. 106] were found responsible for the outbreak in a Californian packing-house in 1944 of a soft-rot disease caused by *Rhizopus nigricans* [*R. stolonifer*]. The reutilization of these containers provided the primary inoculum, which was increased rapidly as a result of the commercial practice of holding sub-grade fruit in the same building to ripen for local markets instead of disposing of it promptly.

It was found that infection took place only through wounds, though these might have dried for at least four hours prior to inoculation. Mycelial spread from adjacent decayed fruit was not dependent on the presence of wounds.

For the extermination of the fungus in the boxes it was found necessary to use dry heat at 300° F. for one hour or to heat freshly wetted boxes to 200° for two hours. Dry air at 250° for one hour reduced the populations of *R. stolonifer*, but lower temperatures proved ineffectual even after three hours.

Walker (J. C.), Whipple (O. C.), Jolivette (J. P.), & Hooker (W. J.). **The limitations of spraying Tomatoes in Wisconsin.**—*Res. Bull. Wis. agric. Exp. Sta.* 152, 23 pp., 7 figs. 1944.

As a result of experiments carried out annually from 1937 to 1942 and designed to test the efficacy of spraying tomatoes for control of early blight (*Macrosporium* [*Alternaria*] *solani*) and leaf spot (*Septoria lycopersici*) [*R.A.M.*, xxiv, p. 293 *et passim*] in southern Wisconsin, where a limited area is planted for canning, it is concluded that in these localities and also in those north of them, little economic increase of yield can be expected from spraying the plants. Improved quality has not been forthcoming. No differences measurable in yield or quality followed trials of various insoluble copper compounds including copper oxychloride sulphate, cupro-potassium oxychloride, cuprocide, and cuprocide 54, though they proved less toxic than Bordeaux mixture.

The investigation did, however, show that tomatoes are too commonly grown on soil insufficiently fertile to give maximum yields. When plants are well nourished, the benefits of foliage protection diminish and, conversely, better results are secured by spraying plants on soils of low fertility than richer ones. Improved quality of fruit was much greater when nutrients were added to the soil than when fungicidal applications were made.

Schroeder (W. T.) & Smith (F. G.). **Preliminary experiment indicates that 2, 4-d (2, 4-dichlorophenoxyacetic acid) treatment of Tomato may reduce losses due to fruit crack molds.**—*Plant Dis. Reptr*, xxx, 6, pp. 197–199, 1946. [Mimeographed.]

Failure of fungicidal sprays to control effectively the loss of tomato fruits through mould invasion of cracks during the rainy latter part of the season has caused concern among canners in New York State. An experiment, intended primarily to test the effect of certain synthetic growth hormones on the ripening of tomato fruits, happened, however, to demonstrate the value of 2, 4-d (2, 4-dichlorophenoxyacetic acid) in reducing the number of fruit cracks and subsequent mould development. After treatment with 2, 4-d at 1,000 p.p.m., of 317 tomato fruits, the percentage of ripe fruit was 98·4, of which 6·5 was sun-scalded and 9·4 cracked, as against (for 298 fruit in the controls) 92·6, 4·1, and 73·9, respectively. Thus, while the amount of cracked fruit was much less in the plots treated with 2, 4-d, there

was little difference in the incidence of sun scald or in the degree of ripeness. All the tomatoes in the plots sprayed with 2, 4-d were firm and fit for canning, apart from a heavy attack of anthracnose [*Colletotrichum phomoides*].

Nicholas (D. J. D.), Jones (J. O.), & Wallace (T.). **Experiments on the control of magnesium deficiency in glasshouse Tomatoes. Progress Report III.**—*Rep. agric. hort. Res. Sta. Bristol, 1945*, pp. 80–94, [? 1946].

As a result of experiments carried out in 1945 [*R.A.M.*, xxv, p. 15] on the control of magnesium deficiency in tomatoes, it is recommended that four or five 1 or 2 per cent. sprays of magnesium sulphate at intervals of three weeks throughout the growing season are recommended for complete control, although three 2 per cent. sprays during the early growth stage were equivalent in effect. A trial application should be made to a few plants 48 hours before the main spraying to ascertain whether spray injury is likely to develop. One early spray was found useful in delaying the onset of magnesium deficiency symptoms and a second late in the season arrested their development. Sunny conditions should be chosen for spraying. A spreader, e.g., sulphonated lorol at 10 oz. per 100 gals. [ibid., xxv, p. 292] must be used. Commercial control, not, however, so effective as that afforded by spraying, was again secured by incorporating 10 cwt. magnesium sulphate (calcined kieserite 30 per cent. magnesium oxide) in the base dressing. No advantage accrues from increasing this amount and such applications had little effect on the incidence of the deficiency the following season.

Day (W. R.). **The pathology of Beech on chalk soils.**—*Quart. J. For.*, xl, 2, pp. 72–82, 1946.

The author describes the development and symptoms of lime-induced chlorosis in beech trees growing on shallow, usually well-drained calcareous soils in England. Owing to the physical and chemical nature of the soil, adverse water conditions occur in dry seasons, and the iron present is rendered inactive. The inability of the trees to utilize the iron causes chlorosis. This in turn prevents the growth and maintenance of an adequate root system. Die-back of the crown and root sets in, predisposing the trees to bark disease associated with *Nectria punicea* and to root decay and butt rot caused by *Ustulina vulgaris* [*R.A.M.*, xxii, p. 157]. The evidence available also indicates that other adverse soil conditions (probably generally associated with drought) induce the death of the roots and predispose trees to butt rot, even if no chlorosis is present.

Breny. **Dothichiza populea.**—*Bull. Soc. for. Belg.*, liii, 6–7, pp. 284–288, 1946.

During 1946 poplar nurseries and young poplar plantations in Belgium have been widely affected by *Dothichiza populea* [*R.A.M.*, xi, p. 338]. Preventive treatment is recommended by appropriate cultural methods [cf. ibid., xxii, p. 183] and fungicidal and insecticidal spraying, while surgical methods should be adopted curatively.

Martin (J. F.). **Spread of White Pine blister rust during 1945.**—*Plant Dis. Reptr*, xxx, 6, pp. 204–206, 1 map, 1946. [Mimeographed.]

The spread of blister rust (*Cronartium ribicola*) [*R.A.M.*, xxv, p. 375] has been noted during 1945 in northern California east into the southern Warner Mountains, where it was encountered for the first time on *Ribes petiolare* in the Modoc National Forest. *Ribes* infection was observed for the first time in 22 counties of the four States of Illinois, Indiana, Iowa (12 counties), and Ohio, and infected white pines were found for the first time in Crawford and Ogemaw Counties, Michigan. Two centres of white pine infection found in Grayson County are first records for south-western Virginia, and a three-acre area of infection apparently

dating from 1936, in Ashe County, North Carolina, constitutes the most southern known infection centre in the region and the first record of the disease for North Carolina. Blister rust was reported for the first time from Anne, Arundel, and Cecil Counties, Maryland, on cultivated *Ribes*.

ETTLINGER (L.). **Über die Gattung Crumenula sensu Rehm mit besonderer Berücksichtigung des Crumenula-Triebsterbens der Pinus-Arten.** [On the genus *Crumenula* sensu Rehm, with special reference to the *Crumenula* die-back of the shoots of *Pinus* species.]—Thesis, Federal Technical College, Zürich, 73 pp., 4 pl. (1 col.), 12 figs., 4 graphs, 1945.

In the Swiss Alpine forest plantings visited by the author the forms assumed by *Crumenula abietina* on pines [*R.A.M.*, xxiii, p. 200] presented certain anomalies in comparison with material from Denmark [ibid., xx, p. 41] and descriptions. They do not, however, transcend the limits of physiologic race differences, and the erection of a new species is accordingly not proposed. It is suggested, however, that the diagnosis of *Brunchorstia pinea* (Karst.) v. Höhn. be amended to include 0- to 9- (mostly 3- to 7)-septate spores, 15 to 57 μ in length.

In pure cultures on malt agar a strain of *C. abietina* from Davos made almost twice as much growth as the Danish isolate supplied by the Bureau voor Schimmelcultures, Baarn, at various temperatures from —3° to 21·5° C., above which point the Danish strain ceased to grow, although it resumed development on transference to laboratory temperature, while the former grew at 24·9° but was apparently killed at 27·9°. The optimum for both was 18·9°. The activity of the Swiss parasite reaches a climax in the cold season and its rate of growth in culture corresponds to that necessary for the involvement of an entire current year's shoot. Under Alpine conditions the interval between the melting of the snow and leafing is very short, and since at 0° the growth rate of the mycelium in culture was about a quarter of its maximum velocity, it is possible that its parasitic activity may persist throughout the winter beneath the snow cover.

Morphological and taxonomic studies on *C. pinicola* [ibid., xvi, p. 136], *C. sororia* Karst., and *C. abietina* led to the conclusion that the three species are distinct. According to Karsten (1871), the asci of *C. pinicola* measure 60 to 70 by 12 to 14 μ and the ascospores 18 to 32 by 3 to 4 μ, the corresponding dimensions of *C. sororia* being 100 to 110 by 10 to 12 and 12 to 18 by 3·5 to 5 μ, respectively. The measurements of the Danish and Swiss specimens of *C. pinicola* examined by the writer agreed exactly with Karsten's data. Rehm's relegation of *C. sororia* to synonymy with *C. pinicola* (Rabenhorsts Kryptogamenfl., 2. Aufl., III Abt., pp. 236–237, 1896; *Ber. bayr. bot. Ges.*, xiii, p. 193, 1912) suggests that he was entirely unfamiliar with the former species and had at his disposal only herbarium material of the latter. *C. abietina* differs from *C. sororia* mainly in its triseptate spores, those of the latter being predominantly non-, rarely uni- to triseptate. The fruit bodies of *C. sororia*, moreover, are pilose, notably at the periphery, and thus present a closer similarity with *C. pinicola* than the scaly-smooth apothecia of *C. abietina*. The fungus observed by Guyot on pine in France, with characters intermediate between those of *C. sororia* and *C. pinicola* [*R.A.M.*, xiii, p. 665], seems to agree best with the former species both in its morphology and symptomatology, as described by Ferdinandsen and Jørgensen [ibid., xviii, p. 212]. *C. sororia* has not yet been observed in Switzerland.

A fuller description is given of *C. laricina* n. sp. [cf. ibid., xxiii, p. 200], the agent of a die-back and needle-fall of larch shoots in the Swiss Alps. The asci are sessile, elongated, round-tipped, 63 to 118 by 5 to 9 μ, containing eight hyaline, elliptical to fusiform, obtuse-ended, straight, uniseptate ascospores, 10 to 17 by 3 to 4 μ. Filiform, septate, mostly branched paraphyses, with thickened or peculiarly lobate tips, project slightly above the asci. The pycnidia of *B. laricina* n. sp., the im-

perfect state of the foregoing, rupture irregularly at maturity and exude chamois-coloured, mucilaginous, simple or indistinctly septate, stromatoid pycnospores; the inner pycnidial walls are densely clothed with septate, branched conidiophores, from the apices of which are abstricted hyaline, uniseptate conidia, 14 to 23 by 3 to 4 μ. *C. laricina* differs from *C. pinicola* in its oblong ascospores, and from the nearly related *C. abietina* and *C. sororia* in the septation and larger length-to-width ratio of the ascospores, as well as in other dimensions. A further distinctive feature of *C. laricina* is its smaller apothecia with their smooth, sharp edges. The straight, uniseptate conidia of *B. laricina* are readily differentiable from those of *B. pinea*.

The optimum temperature for the growth of *C. laricina* on malt agar was about 12°, with a minimum between −5·8° and −3° and a maximum between 21·4° and 24·5°. Not only is the development of *C. laricina* slower than that of *C. abietina*, but the aerial mycelium of the former is higher and denser and the prevailing shade of colour more grey than green. *C. laricina* also fructified more readily than *C. abietina* in culture. Inoculation experiments with *C. laricina* gave negative results, so that the parasitism of the fungus could not be definitely proved. Its probability rests on the exclusive presence of the pathogen on diseased branches, the consistent procurement of the fungus in pure culture from fresh tissue isolations, and the macroscopic and microscopic resemblances of the symptoms of the larch die-back to those of the other *C.* spp. on pines.

The nomenclature and taxonomy of the genus *Crumenula* are discussed. The name *Crumenula* has been dismissed as illegitimate by Nannfeldt [ibid., xi, p. 106], Guyot [ibid., xiii, p. 665], and Groves [ibid., xvi, p. 136], but the author prefers to retain it, adopting Rehm's emendation (Rabenhorst, Discomycetes, p. 235) and including in the list of nomina conservanda *Crumenula* de Not. emend. Rehm.

In a brief appendix the systematic position of *B. gibbosa*, evidently a pure saprophyte, is discussed. The species is readily separable from *B. pinea* by the spore measurements (notably the much greater length of *B. gibbosa*) and mode of curvature, which in *B. pinea* is accentuated in the middle of the conidium and in *B. gibbosa* at either end. The septa are narrower in *B. gibbosa* than in *B. pinea*, and a further difference consists in the varying reactions of the cells of the two species to staining with cotton blue, those of *B. pinea* assuming a uniform tint while those of *B. gibbosa* are densely filled with oil drops.

Leutritz (J.). **A wood soil contact culture technique for laboratory study of wood-destroying fungi, wood decay and wood preservation.**—*Bell Syst. tech. J.*, xxv, 1, pp. 102–135, 4 figs., 1 diag., 5 graphs, 1946.

The soil-contact method herein described was found to be a valuable laboratory adjunct for the study of fungal destruction of cellulose and wood and for the determination of the efficacy of wood and cellulose-preservatives [*R.A.M.*, xxiii, p. 246; xxv, p. 376].

Top soil with a 20 to 25 per cent. moisture content on a dry-weight basis, used as a substratum for decaying pine wood blocks, proved to be an excellent means of controlling the moisture content of the wood during the decay process. The optimum moisture content for the initiation of wood decay was fibre saturation. The initial water content of the wood remained constant during disorganization through maintenance of a constant volume of the wood structure, notwithstanding the loss of wood substance.

Investigation of the addition to the soil of various combinations of nutrients and 'nutrilites' (compounds necessary to fungus nutrition, e.g., vitamins, growth substances, and mineral salts, as defined by R. J. Williams in *Science*, N.S., xvii, p. 607, 1928) showed the importance of these materials in decay. The need for nitrogen by fungi causing destruction of cellulose, demonstrated by Schmitz and Kaufert [*R.A.M.*, xvi, p. 358], was confirmed. A comparison of the results obtained

with nutrient artificial soils and an average top soil indicated the possibility of using the former in the contact test method.

The optimum temperature for *Poria incrassata*, *Polyporus vaporarius* [*Poria vaporaria*], *P. microspora* [ibid., xxii, p. 506], and B(ell) T(elephone) L(aboratories) U–11 was 26° to 28° C., but *Lentinus lepideus*, *Lenzites sepiaria*, and *L. trabea* (BTL/U–40) caused considerable decay at 35°. *Merulius lacrymans*, on the other hand, was responsible for an average reduction in weight of 34 per cent. after six months at 21° compared with only 7 per cent. at 26° to 28° [cf. ibid., xiii, p. 413]. Decay occurred over a wider temperature range and was much more uniform and rapid in soil-contact than in Petri-dish tests or other laboratory methods or in field trials.

Petri-dish assays of preservatives were often misleading. In general, higher retentions were necessary to prevent decay than were indicated by this technique, but occasionally a material giving poor results in the Petri-dish trials acted as a satisfactory preservative of cellulosic derivatives both in soil-contact and field tests. Comparisons between the soil-contact assay and field trials of wood preservatives corroborated the closer approximation of the former to the optimum conditions for decay and the consequent exceptional severity of the tests thereby imposed on the experimental products. The soil-contact method may, in short, be applied to a wide range of materials, including leather, cotton, felt, paper, and jute with the assurance that any preservative preventing decay by this laboratory test, and permanently retained, will be effective under any climatic conditions.

Fire resistant treatment combats fungal decay.—*Timb. News Sawm. Engnr*, liv, 2080, pp. 58–59, 1 fig., 1946.

Tests were recently carried out at the Forest Products Research Laboratory, Princes Risborough, on behalf of the Timber Fireproofing Co., Ltd., to determine the resistance to fungal decay of wood treated by the oxylene process, involving impregnation with a mixture of monoammonium phosphate and borax. The fungi used for the Scots pine tests were *Lentinus lepideus*, *Coniophora cerebella* [*C. puteana*], and *Poria vaporaria*, and for those on beech, *Polystictus versicolor* and *P. sanguineus* (the latter an active agent of hardwood rot in the tropics). The samples, measuring 5 by 2·5 by 1·5 cm., were exposed for three months to attack by the test organisms on an agar medium in culture flasks in an incubator at 22° C., some being previously sterilized by autoclaving or oven-drying to kill adherent mould spores. At the close of the test period none of the oxylene-treated blocks showed any trace of fungal decay, and only the unsterilized samples in contact with *L. lepideus* were slightly mouldy, whereas all the controls were rotten, disorganization in the case of *C. puteana* being complete.

McFarland (W. H.). **The fungicidal properties of DDT.**—*Sth. Lumberm.*, clxxii, 2163, p. 48, 1946.

Laboratory experiments were carried out to determine the efficiency of dichloro diphenyl trichloroethane in the control of the wood-destroying fungi, *Fomes annosus* (Madison 517 strain), *Lenzites trabea*, *Trametes serialis*, and *Poria incrassata*. The compound was only slightly toxic to these organisms and it cannot be recommended as a timber preservative.

Kinberg (W.). **Jahresbericht 1944 (9te Folge) über Holzschutz gegen Holzpilze, tierische Schädlinge und Feuer.** [Annual report for 1944 (9th series) on wood preservation against lignicolous fungi, animal pests, and fire.]—107 pp., Stockholm-Vendelsö, 1945. Kr. 17·50. [Mimeographed.]

Particular interest attaches to the present instalment of the writer's valuable annual compilation of the literature and patents relating to the ravages and control

of wood-destroying fungi and other agencies, since it comprises many references to periodicals, treatises, and the like published during the war years of 1939 to 1944 and now (1945) available for the first time in Europe.

Groves (J. W.) & Skolko (A. J.). **Notes on seed-borne fungi. IV. Acremoniella, Chlamydomyces, and Trichocladium.**—*Canad. J. Res.*, Sect. C, xxiv, 3, pp. 74–80, 3 pl., 1946.

In this paper [cf. *R.A.M.*, xxiv, p. 42] the authors describe and figure the following fungi isolated from agricultural seed received at Ottawa: *Acremoniella atra* from onion, beet, carrot, red fescue (*Festuca rubra*), rye grass (*Lolium perenne*), parsnip, pea, radish, alsike clover (*Trifolium hybridum*), and maize; *A. verrucosa* from pea seed from Ontario and *Taraxacum kok-saghyz* from U.S.S.R.; *Chlamydomyces palmarum* from parsnip and pea; and *Trichocladium asperum* from pumpkin, carrot, lettuce, pea, and broad bean (*Vicia faba*). These fungi do not appear to have any great pathological significance.

Studies on vegetable seed treatments in 1944.—*Plant Dis. Reptr, Suppl.* 161, 66 pp., 1946. [Mimeographed.]

Two hundred and thirty-six uniform seed-treatment tests on ten vegetable crops (soy-beans, beets, carrots, cucumber, lettuce, onions, peas, spinach, sweet corn [maize], and tomato) undertaken by 40 workers in 29 States of the American Union and two Canadian Provinces in pursuance of the co-operative project fostered by the American Phytopathological Society in 1940 are surveyed in this supplement [cf. *R.A.M.*, xxv, p. 379].

R. H. Porter reports that seed-protectants were of some value in about one-third of the tests conducted with Banzei soy-beans in 14 States. Spergon at 2 oz. per bush. gave the most consistent increases in emergence. Under unfavourable conditions for germination, the value of seed-protectants was demonstrated even with high-vitality seed; the benefit for low-vitality material should therefore be greater.

L. D. Leach records significant increases in Detroit dark red beet seedlings in 31 tests in 20 States and one Canadian Province, using arasan (0·25, 0·5, and 1 per cent.), ceresan (1 per cent.), and yellow cuprocide (1·5 per cent.), as compared with untreated seed. Strikingly successful treatments in the 1944 tests compared with results in 1943 reflect differences in vitality and susceptibility to seed decay in the seed lots employed. Weak lots may show better response to seed-protectants than vigorous lots or varieties.

According to reports by B. H. Davis on 19 tests in 15 States and one Canadian Province, arasan (0·5 and 0·75 per cent.) gave rather better increases than spergon at similar dosages, semesan (0·42 per cent.), and red copper oxide and zinc oxide both at 1 per cent. for the Chantenay variety of carrot.

Under field conditions in 1944, less favourable than in the preceding year, semesan and spergon (both at 0·3 per cent.) proved to be the most effective seed-protectants of cucumbers in 12 States according to S. P. Doolittle and F. S. Beecher. Spergon gave much better results than in 1943, but arasan did not maintain its primacy recorded in that year.

G. K. Parris reports that lettuce seed was successfully treated in eight States with red copper oxide, zinc oxide, semesan, arasan, and spergon, all at 2 per cent., the last-named giving the best protection and all proving superior to untreated seed.

Arasan and fermate at 0·5 and 1 per cent., respectively, and semesan at 0·3 and 0·5 per cent., protected onion seed in one-third of the 11 damping-off tests of Yellow Globe onion seed carried out in eight States, according to A. G. Newhall. He reports good control of smut [*Urocystis cepulae*] in two tests by moistening the

seed with 5 per cent. methocel sticker and treating with arasan, fermate, or thiosan, each at 100 or 75 per cent. by weight, the higher concentration proving slightly better.

Spergon at 1½ and 2 oz. induced the best germination of Thomas Laxton peas in 53 tests in 22 States and one Canadian Province; red copper oxide at 2¼, and arasan at 1½ and 2 oz. per bush. gave good results according to the reports of W. T. Schroeder.

G. K. Parris records confirmation of improved stands of spinach in 36 tests in 25 States and one Canadian Province due to seed treatment with arasan at 0·25 and 0·5 fermate at 0·5 and 0·75 and zinc oxide at 1·5 and 2 per cent., the last-named proving consistently best even at the lower dosage.

Arasan, spergon, semesan jr., and barbak C at 1·5 and 3 oz. per bush. all gave higher seedling production and reduction in weaklings over untreated seed of Ioana sweet corn, according to B. H. Davis's report of 30 tests in 19 States and one Canadian Province. Arasan proved best, with decreasing effectiveness of the rest in the order given above, the higher dosage giving the most successful results.

S. P. Doolittle and F. S. Beecher show that in only 42 per cent. of 12 tests in 10 States were improved stands of tomato obtained by using spergon, arasan, and semesan, all at 0·3, yellow cuprocide at 1·5, and new improved ceresan at 0·5 per cent., and as a five-minute dip in a 1 in 1,200 solution. In the beneficial treatments arasan proved best, but semesan, yellow cuprocide, and new improved ceresan were satisfactory. As in 1943, spergon was less effective for tomato seeds. New improved ceresan was equally good in dust form or as a dip.

Snyder (W. C.). **Spermogonia versus pycnidia in Mycosphaerella brassicicola.**—*Phytopathology*, xxxvi, 6, pp. 481–484, 1 fig., 1946.

In the winter of 1945 an examination at Berkeley, California, of numerous ring spot-infected cabbage leaves from field plants revealed the presence of pycnidium-like bodies and an exudate corresponding to those previously described in connexion with the imperfect state of *Mycosphaerella brassicicola* [*R.A.M.*, v, p. 459]. In germination tests, using a mixed suspension of the exudate and ascospores from the perithecia produced on dead, infected leaves the ascospores germinated in all tests within 24 hours, whereas none of the supposed pycnospores made any growth in a week. In 20 inoculation experiments with ascospores and the same number with the exudate, typical ring spot developed on the detached cabbage leaves only from ascospore inoculum incubated in the open. When 20 mono-ascospore cultures and 20 from the exudate were placed out of doors, all the former produced colonies which in time gave rise to the so-called pycnidia and exudate, while no growth was made by the latter. The ascospore cultures on maize meal, moreover, produced mature perithecia.

From the negative results obtained with the presumed pycnospores in germination and inoculation tests, and from their characteristic small size and appearance, it is concluded that these bodies are, in fact, spermatia. It is, then, the concentric spermogonial rings that impart the typical ring-spot appearance to the diseased foliage.

The recognition of the fact that *M. brassicicola* is a homothallic fungus with only one infectious stage (the ascigerous), spermogonia, and no conidia, points to its dissemination by wind, not water, a matter bearing directly on a correct interpretation of the disease cycle of ring spot, and on its control.

Saatidsforsøg med Kaalroer paa kaalbrokfri og paa kaalbroksmittet Jord. [Sowing date experiments with Swedes on club root-free and club root-infected soil.]—*Tidsskr. Planteavl*, l, 3, pp. 539–542, 1946.

Experiments to determine the influence of the sowing date on the incidence of club root [*Plasmodiophora brassicae*] on swedes in soils contaminated by the

pathogen in different localities of Denmark were conducted from 1931 to 1936. In general, the yields were substantially higher and the percentages of diseased roots considerably lower in stands of the first sowing on 9th April than in those of the second and third on 23rd April and 8th May, respectively. A date between 10th and 15th April also appeared from the results of trials from 1938 to 1944 to be the most suitable for the Bangholm variety in healthy soils, whereas a postponement until about the 20th is advisable in the case of Wilhelmsburger to prevent running to seed.

[This paper was also published as *Medd. Forsøgsv. Plantek. Kbh.* 376, 1945.]

Lackey (C. F.). **Occurrence of curly-top virus in meristematic tissue.**—*Phytopathology*, xxxvi, 6, pp. 462–468, 1 fig., 1 diag., 1946.

Sections of sugar beet and bean [*Phaseolus vulgaris*] root tips, 0·2 to 0·4 mm. long, cut from fresh material held in paraffin wax and cooled in a refrigerator were tested for the presence of the curly-top virus in the meristematic tissues of the root cap below the first protophloem sieve-tubes [*R.A.M.*, xviii, p. 150], the sections being macerated in sucrose solution and leafhoppers allowed to feed on the solution and then on test plants. In 22 beet tests, each comprising 7 to 24 root tips, the average percentage of infection was 23·3. In 15 tests on beans, each involving 12 to 24 root tips, the average percentage of infection in sections measuring 0·4 to 0·5 mm. in length was 32·6. Confirmatory evidence of the location of the virus in the meristematic tissue of beet root tips was secured by feeding tests with the leafhopper vector [*Eutettix tenellus*] on infected root tips. In inoculation experiments on beets with suspensions in 5 per cent. sucrose solution of scrapings from the meristematic tissue of curly top-diseased tobacco plants, the incidence of infection ranged from 0 to 70·8 per cent., the maximum being secured with inoculum from young plants inoculated for two to three weeks. The corresponding range in a comparable series of trials with *Nicotiana glutinosa* was from 0 to 70 per cent. Apparently the virus concentration in the cambium decreased as the plants recovered. The author suggests that the virus passes from the phloem into the cambium and multiplies in the meristematic tissue.

Blodgett (E. C.). **The Sclerotinia rot disease of Beans in Idaho.**—*Plant Dis. Reptr*, xxx, 5, pp. 137–144, 2 pl., 1946. [Mimeographed.]

The importance of Idaho as a producer of dry and garden seed beans [*Phaseolus* spp.] has led the author to investigate the increasingly wide and damaging distribution of *Sclerotinia sclerotiorum* rot since it was first recorded in the State by Anderson (*Plant Dis. Reptr*, xxv, p. 457, 1941). The use of combines and the practice of feeding the straw, the subsequent use of the litter, and the common practice of feeding cull beans to sheep have helped to disseminate the fungus, which attacks carrots, peas, and rape, as well as beans. Attention is directed to the importance of maintaining suitable rotations and the possibility of seed transmission.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xx, 5–6, pp. 40M–44M, 1946.

Belgium. By Decree of the Regent dated 28th January, 1946, and taking effect as from 16th February, 1946, all insecticides, fungicides, weed-killers, and other anti-parasitic products may be offered for sale only after authorization by the Minister for Agriculture. Every product so authorized will be registered by the State Phytopharmacy Division, Gembloux. Applicants must state the description and content in active substances of the product, the purpose for which it is intended, the dosage, and the method of employment. The information given is confidential. The official list of authorized products will be published regularly in the *Moniteur belge*.

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